Quantification

GUIDANCE

for the Output-Based Pricing System Regulations

SOR/2019-266

Environment and Climate Change Canada
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GLOSSARY

Act means the *Greenhouse Gas Pollution Pricing Act*.

biomass means plants or plant materials, animal waste or any product made of either of these, including wood and wood products, bio-charcoal, agricultural residues, biologically derived organic matter in municipal and industrial wastes, landfill gas, bio-alcohols, pulping liquor, sludge digestion gas and fuel from animal or plant origin.

CEMS means a continuous emissions monitoring system.

Coal-fired Electricity Regulations means the *Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations.*

electricity generation facility means a covered facility, other than one referred to in paragraph 5(2)(c) of the Regulations, that generates electricity as its primary industrial activity, that is used to generate electricity from fossil fuels and that is composed of one unit or a group of units.

gaseous fuel means a fossil fuel that is gaseous at a temperature of 15°C and a pressure of 101.325kPa.

GHG means greenhouse gas that is set out in column 1 of Schedule 3 of the Act.

GHGRP means the document entitled *Greenhouse Gas Reporting Program, Canada's Greenhouse Gas Quantification Requirements*, published by the Department of the Environment in 2017.

Global warming potential or **GWP** means the global warming potential set out in column 2 of Schedule 3 to the Act for the greenhouse gas set out in column 1 of that Schedule.

HFC means the hydrofluorocarbons set out in items 6 to 24 of Schedule 3 of the Act.

Industrial facility means a covered facility, including a MUSH facility, other than an electricity generation facility.

IPCC Guidelines means the guidelines entitled *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, published by the Institute for Global Environmental Strategies in 2006.

liquid fuel means a fossil fuel that is liquid at a temperature of 15°C and a pressure of 101.325kPa.

MUSH facility means municipalities, universities, schools and hospitals.

natural gas means a mixture of hydrocarbons — such as methane, ethane or propane — that is in a gaseous state at a temperature of 15°C and a pressure of 101.325 kPa and that is composed of at least 70% methane by volume or that has a higher heating value that is not less than 35 MJ/standard m3 and not more than 41 MJ/standard m3. It excludes landfill gas, digester gas,

refinery gas, blast furnace gas, coke oven gas or gas derived through industrial processes from petroleum coke or coal, including synthetic gas.

OBS means an output-based standard, which is either numerical and listed in column 3 of Schedule 1 or calculated in accordance with section 37 of the Regulations.

Opt-In Policy means the *Policy Regarding Voluntary Participation in the Output-Based Pricing System*, published by the Department of the Environment in 2019.

PFC means the perfluorocarbons set out in items 25 to 33 of Schedule 3 of the Act.

Regulations means the *Output-Based Pricing System Regulations.*

solid fuel means a fossil fuel that is solid at a temperature of 15°C and a pressure of 101.325kPa.

specified emission type means an emission type listed in subsection 5(1) of the Regulations.

specified industrial activity means, with respect to a covered facility, an industrial activity specified in paragraph 5(2)(a), subparagraphs 5(2)(b)(i) or (ii), or paragraph 5(c) of the Regulations, as the case may be.

thermal energy means useful thermal energy in the form of steam or hot water that is intended to be used for an industrial purpose.

thermal energy to electricity ratio means, in respect of a unit or equipment that generates electricity, the ratio of the total quantity of thermal energy produced to the total quantity of gross electricity generated by the unit or equipment, not including the quantities from the use of duct burners, in a calendar year and expressed in the same units of measurement.

total capacity means, in respect of a unit or equipment that generates electricity, either

(a) the maximum continuous rating (the maximum net power that can be continuously sustained by a unit or equipment that generates electricity without the use of duct burners, at a temperature of 15˚C and a pressure of 101.325 kPa), expressed in MW of electricity, as most recently reported to a provincial authority of competent jurisdiction or to the electric system operator in the province where the unit or equipment is located, or

(b) if no report has been made, the most electricity that was generated by the unit or equipment during two continuous hours in a calendar year, expressed in MW of electricity.

unit means an assembly comprised of a boiler or combustion engine and any other equipment that is physically connected to either, including duct burners and other combustion devices, heat recovery systems, steam turbines, generators and emission control devices, and that generates electricity and, if applicable, produces thermal energy from the combustion of fossil fuels.

WCI Method means the document entitled *Final Essential Requirements of Mandatory Reporting*, published on December 17, 2010 by the Western Climate Initiative.

1. DISCLAIMER

Where there are any inconsistencies between this guidance document, the *Greenhouse Gas Pollution Pricing Act* (Act) and/or the *Output-Based Pricing System Regulations* (Regulations) the following shall prevail: the Act enacted by section 186 of chapter 12 of the Statutes of Canada, 2018, in force on assent June 21, 2018 and the Regulations, as registered by the Clerk of the Privy Council and published in the *Canada Gazette*, Part II, on July 10, 2019.

2. BACKGROUND

The Regulations, together with the Act, establish the Output-Based Pricing System (OBPS). The objective of the OBPS is to retain a price on carbon pollution that creates an incentive for emissions-intensive and trade-exposed industrial facilities to reduce emissions, while maintaining the competitiveness of Canadian industry relative to their international peers and preventing carbon leakage.

Persons subject to the Act and Regulations are required to compensate for the facility's GHG emissions, if they exceed the annual emissions limit applicable to the facility. Tradable surplus credits that can be used for compliance are issued to persons responsible for facilities that emit GHGs in a quantity that is below their limit. This creates an ongoing financial incentive for facilities to reduce their emission intensity in order to either reduce the amount owed for compensation or to emit below their limit and earn surplus credits.

3. PURPOSE

This document is intended to provide guidance on the quantification requirements of GHGs and production, including emissions limits and calculated output-based standards (OBS), for covered facilities under the Regulations. All references made in this document are in regards to the Regulations unless otherwise specified.

4. KEY DEFINITIONS OF THE REGULATIONS

As per section 1, for the purposes of the Act and the Regulations, **a facility** means:

(1)(a) all of the following elements that are operated in an integrated way to carry out an industrial activity:

i. a site, or multiple sites, at which an industrial activity is carried out and the buildings, equipment, and other structures and stationary items located on those sites, and

ii. any other sites used in conjunction with the industrial activity, including a quarry, tailings pond, wastewater lagoon or pond and landfill; or

(b) the portion of a natural gas transmission pipeline system within a province, used to transmit processed natural gas, of which the pipelines and associated installations or equipment — including compressor stations, storage installations and compressors — are operated in an integrated way, but excludes pipelines, installations or equipment that are used in the local distribution of natural gas and that are downstream of a metering station.

More than one person responsible — paragraph 1(a)
(2) If more than one person is responsible for the elements referred to in subparagraph (1)(a)(i) or (ii) as an owner or otherwise, including having the charge, management or control of, or as the true decision maker with respect to their operations, those elements are only included in the definition of facility if there is at least one person who is responsible for, owns, has the charge management or control of, or is the true decision maker in common.

More than one person responsible — paragraph 1(b)
(3) If more than one person is responsible for the pipelines and associated installations or equipment referred to in paragraph (1)(b) as an owner or otherwise, including having the charge, management or control of, or as the true decision maker with respect to the pipelines and associated installations or equipment, those pipelines and associated installations or equipment are only included in the definition of facility if there is at least one person who is responsible for, owns, has the charge management or control of, or is the true decision maker in common.

Single facility
(4) If two or more facilities referred to in paragraph (b) of the definition facility in subsection (1) within the same province have the same person responsible, or, if they have more than one person responsible, they have at least one person responsible in common, and are operated in an integrated way, they are deemed to be a single facility.

Interpretation
(5) With respect to a facility
- (a) any part of a public road or of a railway track that is bordered on both sides by the facility and used to carry out the facility's industrial activities is deemed to be part of the facility;
- (b) for greater certainty, any part of a railway track that is used exclusively to carry out the facility's industrial activities is part of the facility;
- (c) for greater certainty, buildings that are used for legal, administrative or management purposes and that are not located where an industrial activity is carried out are not included for the purposes of the definition of facility; and
- (d) if two or more facilities referred to in paragraph (b) of the definition facility in subsection (1), within the same province, have the same person responsible or a person responsible in common and are not operated in an integrated way, they each constitute a separate facility.

As per subsection 2(1), an **electricity generation** facility means a covered facility, other than one referred to in paragraph 5(2)(c), that generates electricity as its primary industrial activity, that is used to generate electricity from fossil fuels and that is composed of one unit or a group of units.

As per subsection 5(1), the **specified emission types** for which GHGs must be quantified, for a covered facility are:

- **Stationary fuel combustion emissions** means emissions from stationary devices that combust solid fuels, liquid fuels, gaseous fuels, or tires or asphalt shingles, whether in whole or in part, for the purpose of producing useful heat.

- **Industrial process emissions** means emissions from an industrial process that involves a chemical or physical reaction other than combustion and the purpose of which is not to produce useful heat.

- **Industrial product use emissions** means emissions from the use of a product in an industrial process that does not involve a chemical or physical reaction and does not react in the process, including emissions from the use of sulphur hexafluoride (SF6), HFCs and PFCs as cover gases and the use of HFCs and PFCs in a foam-blowing process.

- **Venting emissions** means controlled emissions that occur due to the design of a facility, to procedures used in the manufacture or processing of a substance or product or to pressure exceeding the capacity of the equipment at the facility.

- **Flaring emissions** means controlled emissions of gases from industrial activities as a result of the combustion of a gas or liquid stream produced at a facility, the purpose of which is not to produce useful heat. It does not include emissions from the flaring of landfill gas.

- **Leakage emissions** means uncontrolled emissions. It does not include industrial process emissions and industrial product use emissions.

- **On-site transportation emissions** means emissions from registered or unregistered vehicles and other machinery that are used at the facility for the transport of substances, materials, equipment or products used in a production process or for the transport of people, and that are fuelled using fuels delivered in a delivery to which an exemption certificate referred to in subparagraph 36(1)(b)(v) of the Act applies.

- **Waste emissions** means emissions that result from waste disposal at a facility, including the landfilling of solid waste, the biological treatment or incineration of waste and the flaring of landfill gas. Waste emissions do not include emissions from the combustion of tires or asphalt shingles, whether in whole or in part, to produce useful heat or on-site transportation emissions.

- **Wastewater emissions** means emissions resulting from industrial wastewater and industrial wastewater treatment at a facility.

Subsection 5(2) sets out the specified industrial activities for which the Regulations established output-based standards. For facilities engaged in specified industrial activities referred to in:

- **Paragraph 5(2)(a)** – the specified industrial activities are industrial activities listed in Schedule 1 (mandatory facilities);

- **Subparagraph 5(2)(b)(i)** – the specified industrial activities are an industrial activity listed in Schedule 1 that a facility identifies as its primary activity in a request submitted under subsection 172(1) of the Act and any additional industrial activities listed in Schedule 1 (facilities referred to in the Opt-in Policy);

- **Subparagraph 5(2)(b)(ii)** – the specified industrial activities are an industrial activity not listed in Schedule 1, identified in a request submitted under subsection 172(1) of the Act as the primary activity and any additional industrial activities listed in Schedule 1 that are specified in the notice that accompanies the covered facility certificate (facilities referred to in the Opt-in Policy);

- **Paragraph 5(2)(c)** – the specified industrial activities are industrial activities listed on Schedule 1 identified in the request submitted under subsection 172(1) of the Act by a facility whose primary activity is not an industrial activity (facilities referred to in the Opt-in Policy e.g. MUSH facilities).

For references made in regards to a facility in this document, it is for a covered facility that is covered under the Regulations and the Act.

Please note that all requirements described in this document are obligations of the person responsible for the covered facility (as described in section 10 of the Regulations).

Refer to Appendix A for frequently asked questions.

5. QUANTIFICATION OF GHGs

The quantity of GHGs that are emitted from a facility must be determined in accordance with section 35. The quantification of those GHGs are set out in sections 16 to 25 which also include special quantification rules (subsections 17(5) and 20(6), sections 22 and 23) and provisions for seeking a permit to use an alternative quantification method (sections 26 to 30). This section of the guidance document also provides some calculated examples to clarify certain provisions in the Regulations.

5.1. Quantification of GHGs for Industrial Facilities

A facility's total quantity of GHGs from all activities, including the generation of electricity must be quantified for an industrial facility, other than an electricity generation facility. In addition, the sampling, analysis and measurement requirements needs to be complied with as specified in sections 17 to 19 and 22 to 25. For special rules in regards to quantification (subsection 17(5) and sections 22 to 25), refer to section 5.3 of this document.

The total quantity of GHGs is to be calculated as per subsection 17(1), which is the quantity used for the variable A (equation in section 35), to determine the quantity of GHGs emitted. The total

quantity of GHGs is to be calculated for each specified emission type (see Key Definitions of the Regulations) and the applicable GHG.

The quantity of GHGs from electricity generation for an industrial facility that also generates electricity must be quantified using the methods applicable to the industrial activities engaged in at the facility, as per section 18. For example, if a facility is engaged in the production of lime and also generates electricity, the GHGs from the generation of electricity are calculated in accordance with the methods applicable to the production of lime.

For industrial activities **set out** in Schedule 1, GHGs from specified emission types must be quantified as described below and shown in Figure 1:

Column 4 of Schedule 1 identifies the applicable Part of Schedule 3 that contains the quantification methods applicable to the industrial activity.

i. The GHGs set out in Column 2 of Schedule 3 from the specified emission types set out in Column 1 of Schedule 3 must be quantified as follows:

   a. Quantify the GHGs in accordance with the methods identified in column 3 of the table of the applicable Part in Schedule 3;

   b. Follow the sampling, analysis and measurement requirements identified in column 4 of the table of the applicable Part in Schedule 3, and

   c. For circumstances where data is missing, replacement data is to be quantified in accordance with the methods prescribed in column 5 of the table of the applicable Part in Schedule 3.

ii. If there is no listed quantification method for a GHG or a specified emission type in the applicable Part of Schedule 3, then:

   a. GHGs must be quantified in accordance with the applicable methods in the GHGRP or the WCI method. However, if there are no applicable quantification methods in the GHGRP or the WCI method, then the IPCC Guidelines may be used;

   b. The sampling, analysis and measurement requirements set out in those methods or guidelines must be followed, and

   c. For circumstances where data is missing, replacement data is to be quantified also in accordance with those methods or guidelines.

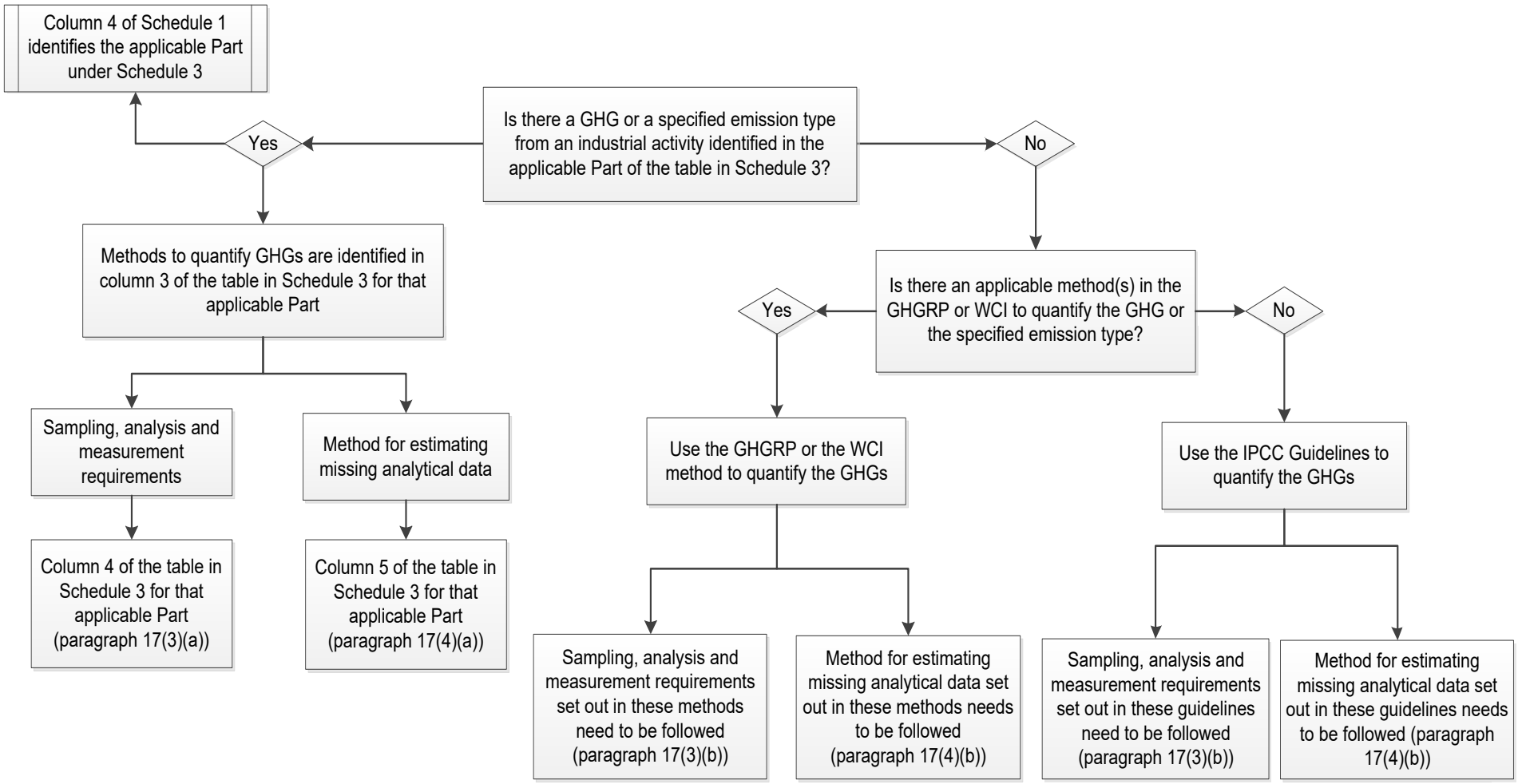


Figure 1: Quantification of GHGs for an industrial facility other than a MUSH facility engaged in an industrial activity listed in Schedule 1 (Mandatory and Part 1 of Opt-in Policy facilities).

For industrial activities **not set out** in Schedule 1, GHGs from specified emission types must be quantified as described below (paragraph 17(2)(c)) and shown in Figure 2:

a. The GHGRP or WCI method may be used to quantify GHGs using applicable methods for those industrial activities. However, if there are no applicable quantification methods then the IPCC Guidelines may be used,

b. The sampling, analysis and measurement requirements set out in those methods or guidelines must to be followed, and

c. For circumstances where data is missing, replacement data is to be quantified in accordance with those methods or guidelines.

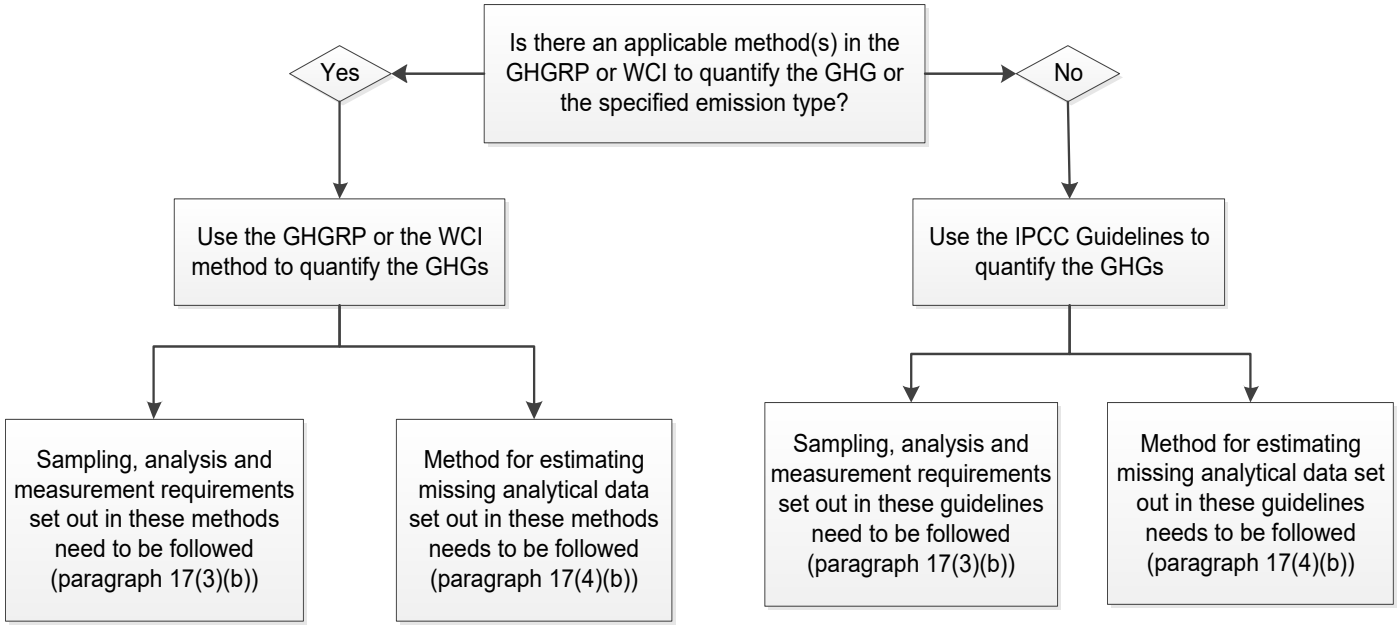


Figure 2: Quantification of GHGs for a facility engaged in an industrial activity **not** listed in Schedule 1 (Part 2 of the Opt-in Policy facilities).

As per section 24, the facility's total quantity of GHGs calculated under subsections 17(1) is to be rounded to the nearest whole number and, if the number is equidistant between two whole consecutive numbers, it is then rounded to the higher number.

MUSH and other non-industrial facilities:

As set out in section 19, for a facility referred to in paragraph 5(2)(c), the quantities of GHGs are to be quantified and calculated in accordance with the GHGRP or the WCI method, if applicable, or the IPCC Guidelines if the other methods are not applicable. The type of facility referred to in paragraph 5(2)(c) includes MUSH facilities.

Other Considerations:

Emissions are not to be included twice when calculating a facility's GHG emissions. If the quantification methods that apply to an industrial activity or facility result in the calculation of the same emissions under two specified emission types, the emissions must not be included twice. For example, if the quantification methods for a facility with industrial process emissions that are vented result in calculating the emissions twice – once as industrial process emissions and once as vented emissions, the quantity of emissions must only be included once.

For a facility that both produces coal by mining coal deposits and has a unit or a group of units registered under the Coal-fired Electricity Regulations, refer to section 9.5.2 of this document for additional quantification requirements.

Example 1: An industrial facility engaged in a Schedule 1 activity

A facility is engaged in an industrial activity listed in Schedule 1. The facility modified the process within the industrial activity, which resulted in the installation of a new anaerobic reactor. As a result, there are additional GHGs resulting from wastewater treatment. There is no prescribed method set out in column 3 of the table in the industrial activity's applicable Part of Schedule 3 for the quantification of GHGs from wastewater emissions.

How should the GHGs from wastewater emissions be quantified?

As per paragraph 17(2)(b), the GHGRP or the WCI method must be referred to in order to find an applicable method to quantify GHGs from wastewater emissions. In this case, the WCI Method WCI.203(g) has applicable methods to calculate CH_4 and N_2O from anaerobic wastewater treatment. Therefore, the WCI method is to be used and the sampling, analysis, measurement and replacement data requirements set out in that method must be complied with.

Example 2: An industrial facility engaged in an industrial activity not listed in Schedule 1

A facility that has been designated as a covered facility under subsection 172(1) of the Act, has specified as its primary activity in its request for designation, an industrial activity not listed in Schedule 1. This activity is specified in the notice that accompanies the covered facility's certificate for the facility as a specified industrial activity (Part 2 of the Opt-in Policy). This means the facility does not have an applicable Part under Schedule 3 and hence no prescribed quantification methods are available in Schedule 3 for that industrial activity.

The specified emission types occurring at the facility are stationary combustion, on-site transportation and waste emissions. The waste emissions are due to the combustion of solid and liquid waste in controlled incineration. In addition, the facility purchases electricity from the grid.

How should the facility's GHGs be quantified?

As per paragraph 17(2)(c), the GHGRP or the WCI method must be referred to in order to find an applicable method for the quantification of stationary combustion, on-site transportation and waste emissions.

1. There are applicable methods under GHGRP to calculate GHGs from stationary combustion and on-site transportation emissions:

    i. Sections 2.A and 2.B of GHGRP are quantification methods to calculate GHG from stationary combustion and on-site transportation emissions.

    ii. Those applicable GHGRP methods must be used and the sampling, analysis, measurement and replacement data requirements set out in those method must be complied with.

2. There are no applicable methods in the GHGRP or the WCI method to calculate GHGs from waste emissions.

3. In this case, the IPCC Guidelines must be referred to in order to quantify GHGs from waste emissions.

    i. The IPCC Guidelines has an applicable method for calculating GHGs from incineration and open burning waste in Chapter 5.

    ii. The sampling, analysis, measurement and replacement data requirements set out in those guidelines must be complied with.

Should GHGs from purchased electricity be quantified?

No, GHGs from purchased electricity do not need to be quantified. GHGs from electricity are only quantified if the electricity is generated at the facility; as per section 18, those GHGs are to be quantified as per the methods applicable to the industrial activity that the facility is engaged in.

5.2. Quantification of GHGs for Electricity Generation Facilities

The total quantity of GHGs from each unit at an electricity generation facility must be quantified and the sampling, analysis, measurement and replacement data requirements must be complied with, identified in sections 20 to 25.

The unit's total quantity of GHGs is the sum of GHGs of stationary fuel combustion emissions (the first sub bullet below) and GHGs from emissions other than stationary fuel combustion emissions (the second sub bullet below) as described below:

1. The quantification requirements for stationary fuel combustion emissions for an electricity generation facility depend on the type of fossil fuel used to generate electricity by each unit and whether that unit is registered or not under the Coal-fired Electricity Regulations. There are three cases:

   Case 1: The unit **is registered** under the Coal-fired Electricity Regulations.

   Case 2: The unit is **not registered** under the Coal-fired Electricity Regulations and generates electricity from the combustion of natural gas.

   Case 3: Any other unit in which Cases 1 and 2 are not applicable.

   For stationary fuel combustion emissions only, the table below illustrates the quantification requirements for each unit as per Division 1 of Part 38 of Schedule 3 to calculate CO_2, CH_4 and N_2O depending on the applicable case.

Table 1: Quantification of GHGs from stationary fuel combustion emissions at an electricity generation facility

GHGs	Case	Method for Calculating GHGs	Sampling, Analysis and Measurement Requirements	Method for Estimating Missing Analytical Data
CO_2	Case 1	Section 20 to 26 of the Coal-fired Electricity Regulations	Section 27 of the Coal-fired Electricity Regulations	Section 28 of the Coal-fired Electricity Regulations
	Case 2	Sections 12 to 18 of the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*	Sections 19 of the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*	Sections 20 of the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*
	Case 3	GHGRP 2.A	GHGRP 2.C	GHGRP 2.D
CH_4 and N_2O	All cases	GHGRP 2.B	GHGRP 2.C	GHGRP 2.D

2. For specified emission types, **other than stationary fuel combustion emissions**, GHGs must be quantified as described below and shown in Figure 3:

    i. The quantification methods are identified in column 3 of the table in Part 38 of Schedule 3.

        a. The sampling, analysis and measurement requirements are identified in column 4 of the table in Part 38 of Schedule 3.

        b. For circumstances where data is missing, replacement data is to be calculated in accordance with the methods prescribed in column 5 of the table in Part 38 of Schedule 3.

    ii. If there is no listed method for a GHG from a specified emission type in Part 38 of Schedule 3, the GHGRP or WCI method may be used. However, if there are no applicable methods then the IPCC Guidelines must be used.

        a. The sampling, analysis and measurement requirements set out in those methods or guidelines need to be followed.

        b. For circumstances where data is missing, replacement data is to be calculated in accordance with those methods or guidelines.

For special rules in regards to quantification (subsection 20(6) and sections 22 to 25), refer to section 5.3 of this document.

For a facility that both produces coal by mining coal deposits and has a unit or a group of units registered under the Coal-fired Electricity Regulations, refer to section 9.5.2 of this document for quantification requirements.

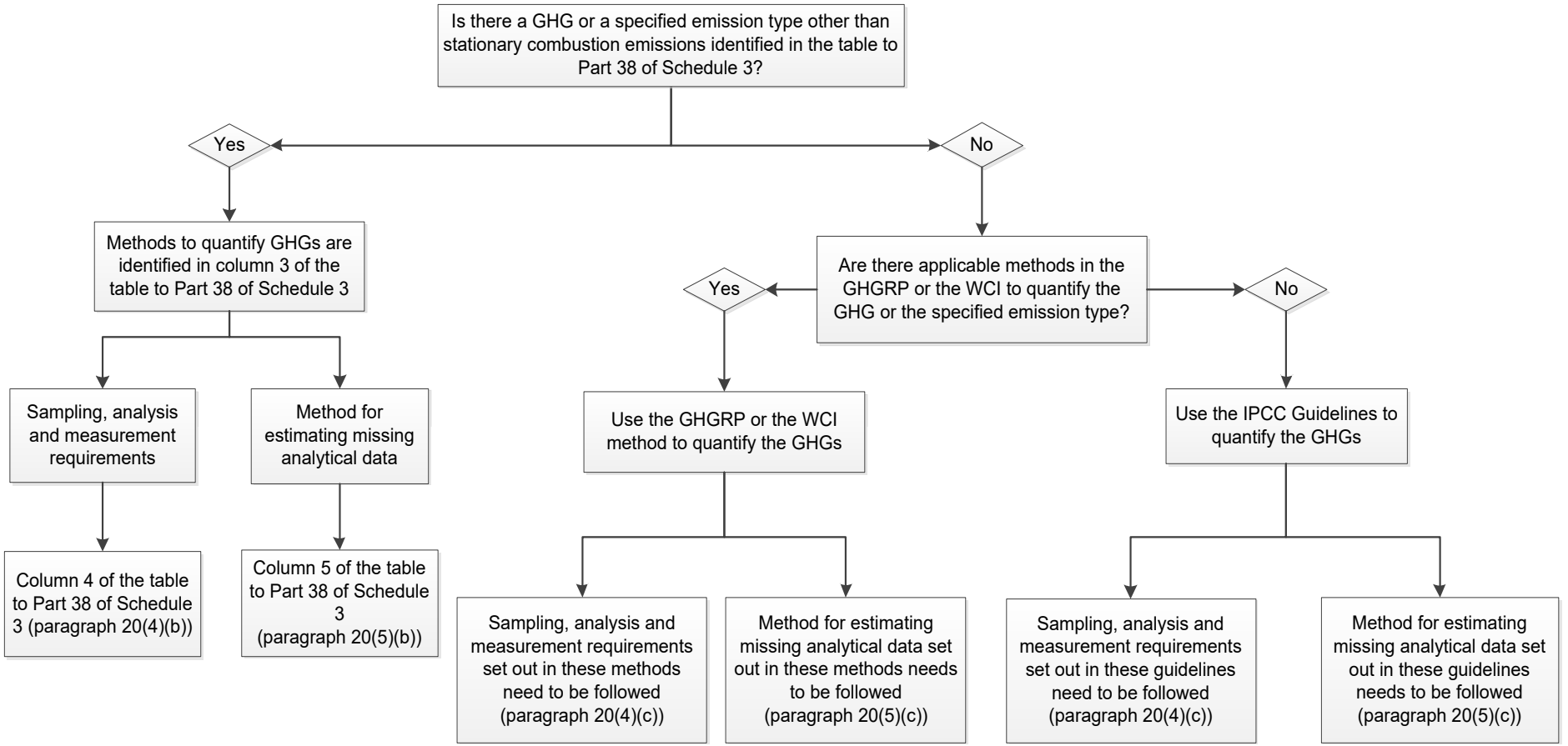


Figure 3: Quantification of GHGs from specified emission types, other than stationary fuel combustion emissions, for an electricity generation facility.

As per section 24, an electricity generation facility's total quantity of GHGs calculated under subsections 20(1) is to be rounded to the nearest whole number and, if the number is equidistant between two whole consecutive numbers, it is then rounded to the higher number.

5.2.1. Apportioning GHGs

For an electricity generation facility, where GHGs other than GHGs for stationary fuel combustion emissions **can only be quantified at a facility level,** those GHGs must be apportioned to the facility's units as per subsection 20(3). Those GHGs must be apportioned based on the ratio of each unit's total electricity generation relative to the facility's total electricity generation. Refer to the example below on how to apportion GHGs.

Example 3: **Apportioning GHGs**

An electricity generation facility with two units emits stationary combustion and on-site transportation emissions. The CO_2 from on-site transportation emissions can only be quantified at the facility level and they are 10,000 tonnes of CO_2. That quantity of CO_2 needs to be apportioned to all the units in the facility as explained in the example below.

	Electricity generated	Stationary fuel combustion emissions
Unit 1	100 GWh	30,000 tonnes of CO_2
Unit 2	150 GWh	50,000 tonnes of CO_2
Facility's total	250 GWh	-

The following steps show how to calculate the quantity of CO_2 for each unit at the facility:

1. Calculate the ratio of each unit's total electricity generation relative to the facility's total electricity generation.

$$\text{Ratio for Unit 1} = \left(\frac{100\ \text{Wh}}{250\ \text{Wh}}\right) = 0.4$$

$$\text{Ratio for Unit 2} = \left(\frac{150\ \text{Wh}}{250\ \text{Wh}}\right) = 0.6$$

2. Multiply the ratio for Unit 1 with the facility's CO_2 from on-site transportation emissions in order to apportion for each unit.

$$\text{Unit 1 } CO_2 \text{ from on} - \text{site transportation emissions} = 0.4 \times 10{,}000 \text{ tonnes of } CO_2$$
$$= 4{,}000 \text{ tonnes of } CO_2$$

$$\text{Unit 2 } CO_2 \text{ from on} - \text{site transportation emissions} = 0.6 \times 10{,}000 \text{ tonnes of } CO_2$$
$$= 6{,}000 \text{ tonnes of } CO_2$$

3. Calculate the quantity of CO_2 for each unit.

$$\text{Quantity of } CO_2 \text{ for Unit 1} = 30{,}000 \text{ tonnes of } CO_2 + 4{,}000 \text{ tonnes of } CO_2$$
$$= \mathbf{34{,}000 \text{ tonnes of } CO_2}$$

$$\text{Quantity of } CO_2 \text{ for Unit 2} = 50{,}000 \text{ tonnes of } CO_2 + 6{,}000 \text{ tonnes of } CO_2$$
$$= \mathbf{56{,}000 \text{ tonnes of } CO_2}$$

The quantity of CO_2 for Unit 1 and 2 is 34,000 and 56,000 tonnes of CO_2, respectively.

5.3. Special Rules

Certain provisions in the Regulations do not require the quantification of certain GHGs or for certain GHGs to be included in the facility's total quantity of GHGs. Those exclusions are listed below. These provisions apply to both industrial and electricity generation facilities:

1. As per subsection 22(1), CO_2 from biomass **is not quantified and is not included in the quantity of CO_2** when quantifying the facility's total quantity of GHGs from the facility as per subsections 17(2) to (4) or subsections 20(2) to (5). However if a CEMS is used to measure the quantity of CO_2 at the facility then CO_2 from biomass will have to be quantified and deducted from the quantity of CO_2 as measured by the CEMS. The quantity of CO_2 from biomass **is not to be reported** as part of the facility's annual report.

2. As per subsections 17(5) and 20(6), CH_4 and N_2O generated from stationary devices that combust biomass for the purpose of producing useful heat **must be quantified** but **are not to be included** in the quantity of GHGs from stationary fuel combustion emissions calculated in subsections 17(2) to (4) or subsections 20(2) to (5). These quantities of CH_4 and N_2O **are to be reported separately** as part of the facility's annual report (section 4 of Schedule 2).

3. As per subsection 22(2), quantification of CH_4 from venting or leakage emissions **is not required** for facilities engaged in:

    i. The production of bitumen and other crude oil (item 1 of Schedule 1);
    ii. the upgrading of bitumen or heavy oil (item 2 of Schedule 1);
    iii. the processing of natural gas (item 4 of Schedule 1); and
    iv. the transmission of processed natural gas (item 5 of Schedule 1).

    CH_4 from venting and leakage emissions is not included as part of the quantity of CH_4 calculated as per subsections 17(2) to (4).

4. As per section 23, the **"de minimis"** provision allows the exclusion of a GHG for any specified emission type if it represents less than or equal to 0.5% of the facility's total quantity of GHGs, when expressed in tonnes of CO_2e. With the specification that the sum of the quantity of GHGs that are to be excluded must not exceed 0.5% of the facility's total quantity of GHGs.

If those parameters are met, then those GHGs can be excluded from the determination made under subsection 17(2) to (4) or 20(2) to (5). Refer to the example below for how to calculate the "de minimis".

Example 4: De minimis

All GHGs from all specified emission types for a facility are quantified based on the quantification requirements under the Regulations, but minor quantities can be excluded from the total quantity of GHGs. The table below illustrates the facility's total quantity of GHGs and the percentage of GHGs contributed by both the gas and specified emission type. Some of the GHGs from stationary fuel combustion, leakage and on-site transportation emissions are below 0.5% of the facility's total quantity of GHGs.

Do these GHGs have to be included in those GHG under subsection 17(1) or 20(1)?

Specified emission type	**The quantity of GHGs in tonnes of CO_2e (% of GHGs contribution by gas or specified emission type)**			
	CO_2	CH_4	N_2O	Total
Stationary fuel combustion emissions	2,940.30 **(1.5%)**	2.26 **(0.0%)**	13.2 **(0.0%)**	2,955.76 **(1.5%)**
Industrial process emissions	127,431.33 **(65.1%)**	2.26 **(0.0%)**	62,563.2 **(32.0%)**	189,996.79 **(97.1%)**
Leakage emissions	2.8 **(0.0%)**	938.88 **(0.5%)**	0.0 **(0.0%)**	941.68 **(0.5%)**
On-site transportation emissions	1,692.13 **(0.9%)**	3.25 **(0.0%)**	166.14 **(0.1%)**	1,861.52 **(1.0%)**
	Facility's total quantity of GHGs			**195,756**

Based on the table:

(a) The percentages of CH_4 and N_2O from stationary fuel combustion emissions are both less than 0.5% of the facility's total quantity of GHGs.

(b) The percentage of CH_4 from industrial process emissions is less than 0.5% of the facility's total quantity of GHGs.

(c) The percentages of CO_2 and CH_4 from leakage emissions are both equal or less than to 0.5% of the facility's total quantity of GHGs.

(d) The percentages of CH_4 and N_2O from on-site transportation emissions are both less than 0.5% of the facility's total quantity of GHGs.

As per subsection 23(1), the facility is not required to include the GHGs listed in (a) to (d), however, the sum of those GHGs must not exceed 0.5% of the facility's total quantity of GHGs as per subsection 23(2).

The following steps are used to determine if the sum of the quantity of GHGs listed in (a) to (d) exceed 0.5% of the facility's total quantity of GHGs.

$$\begin{aligned}&The\ sum\ of\ quantity\ of\ GHG\ listed\ in\ (a)\ to\ (d)\\&= [CH_4 + N_2O]_{stationary\ fuel\ combustion\ emissions} + [CH_4]_{industrial\ process\ emissions}\\&+ [CO_2 + CH_4]_{leakage\ emissions} + [CH_4 + N_2O]_{on-site\ transportation\ emissions}\\&= [2.26 + 13.2] + 2.26 + [2.8 + 938.88] + [3.25 + 166.14]\\&= 1{,}128.79\ tonnes\ of\ CO_2e\end{aligned}$$

$$\begin{aligned}&The\ ratio\ of\ the\ quantity\ of\ GHG\ listed\ in\ (a)\ to\ (d)\ to\ the\ total\ quantity\ of\ GHGs\\&= \frac{1{,}128.79\ tonnes\ of\ CO_2e}{195{,}756\ tonnes\ of\ CO_2e} \times 100 = \mathbf{0.6}\%\end{aligned}$$

Based on the calculation above, the percentage of those GHGs exceed 0.5% of the facility's total quantity of GHGs. Therefore, the facility must include some of the GHGs listed in (a) to (d) under subsection 17(2) to (4) or 20(2) to (5). The GHGs not included must not exceed 0.5% of the facility's total quantity of GHGs.

In this case, for example, it was decided to include the GHGs listed in (d) for on site-transportation emissions, and not to include the GHGs listed in (a) to (c) which have to be summed to check if those GHGs are less than or equal to 0.5% of the facility's total quantify of GHGs.

The following steps calculate if the sum of the GHGs listed in (a) to (c) do not exceed 0.5% of the facility's total quantity of GHGs.

$$\begin{aligned}&The\ sum\ of\ the\ quantity\ of\ GHG\ listed\ in\ (a)\ to\ (c)\\&= [CH_4 + N_2O]_{\ stationary\ fuel\ combustion\ emissions} + [CH_4]_{industrial\ process\ emissions}\\&+ [CO_2 + CH_4]_{leakage\ emissions} = [2.26 + 13.2] + 2.26 + [2.8 + 938.88]\\&= 959.40\ tonnes\ of\ CO_2e\end{aligned}$$

$$The\ ratio\ of\ those\ GHGs\ listed\ in\ (a)\ to\ (c)\ to\ the\ total\ quantity\ of\ GHGs = \frac{959.40\ tonnes\ of\ CO_2e}{195{,}756\ tonnes\ of\ CO_2e} \times 100 = \mathbf{0.5\%}$$

Therefore, the following GHGs do not need to be included under subsection 17(2) to (4) or 20(2) to (5):

- **CH_4 and N_2O from stationary fuel combustion emissions,**
- **CH_4 from industrial process emissions, and**
- **CO_2 and CH_4 from leakage emissions.**

5.4. Carbon Capture and Storage

As per subsection 35(1), the quantity of CO_2 that is permanently stored in an eligible storage project (variable B) is deducted from a facility's total quantity of GHGs (variable A). However, the quantity of CO_2 from biomass that is stored is not deducted since CO_2 from biomass is not included in the total quantity of GHGs. Eligible storage projects are listed in subsection 35(2). If the facility captures CO_2 but does not store it in accordance with the requirements in subsection 35(2), then the CO_2 is deemed to be emitted and must be included as part of the facility's total quantity of GHG emitted. For greater certainty, any quantity of CO_2 cannot be deducted if it was not already included in the facility's total quantity of GHGs.

The quantity of CO_2 expressed in CO_2e tonnes, that is captured at the facility and subsequently stored must be quantified using section 1 of the GHGRP.

5.4.1. Continuous Emission Monitoring Systems

As per section 25, any Continuous Emission Monitoring Systems (CEMS) used by the facility must comply with the *Reference Method for Source Testing: Quantification of Carbon Dioxide Releases by Continuous Emission Monitoring Systems from Thermal Power Generation*, published by the Minister of the Environment in June 2012. If a CEMS is used to measure CO_2 at the facility, then the quantity of CO_2 from biomass will have to be quantified and deducted from the total quantity of CO_2 as measured by the CEMS.

5.5. Alternative Method

For the 2019 calendar year, as per section 80, an alternative method in the IPCC Guidelines may be used to quantify GHGs from the industrial activity (or activities) at a facility, in the following cases:

1. If it is not technically feasible to meet the prescribed sampling, measurement and analysis requirements such as not having the appropriate meters for sampling.

2. If a GHG for a specified emissions type is less than 20 kilotonnes of carbon dioxide equivalent (CO_2e) and is less than 3% of the facility's total quantity of GHGs.

Starting on January 1st 2020, as per sections 26 to 30, a facility may request a permit to use an alternative method to quantify their GHGs other than the ones prescribed in the Regulations. The Minister will issue a permit if the criteria below are met:

1. It is not technically or economically feasible to use the prescribed methods or guidelines at the time at which the facility applies under the Regulations;

2. The quantification method (i.e. alternative method) proposed by the facility is at least as rigorous as the prescribed quantification method or guideline in question. Both the proposed and prescribed methods should obtain equivalent results in determining any GHG;

3. A plan was provided to describe the measures (i.e. actions and procedures) that will be taken in order to implement the prescribed method or guideline. This plan should include the implementation period that should not be more than 2 years; and

4. The term requested for the permit cannot exceed the period for which the permit is necessary (i.e. if a permit is required for one year only, then a term of two years cannot be requested).

Schedule 4 lists the required information that must be submitted to the Minister for obtaining a permit.

Example 5: Permit to use an alternative method

A facility's GHG must be quantified based on the quantification methodologies prescribed in sections 17 to 25. However, starting in the 2020 compliance period, a permit may be requested to use an alternative quantification method for the quantification of any GHG. For example, if the facility encounters some of the following challenges:

- It is not technically or economically feasible for the facility to install instruments or equipment used to perform and comply with the prescribed methods under the sections 17 and 20.

- The facility has encountered an unexpected event within the facility's boundaries such as fire, explosion, flooding, extreme equipment failure, etc. Due to these unforeseen circumstances, the facility is unable to comply with the prescribed methods under the sections 17 and 20.

6. QUANTIFICATION OF PRODUCTION AND THERMAL ENERGY

This section provides guidelines on the quantification of production and thermal energy including a summary flowchart on the quantification of production for both industrial facilities and electricity generation facilities.

6.1. Quantification of Production for Industrial Facilities

As per subsection 31(1), production needs to be quantified for all the specified industrial activities that the facility is engaged in, as it is needed to calculate the emissions limit. The following steps help determine the unit of measurement for those activities:

i. If the specified industrial activity is listed in Schedule 1:
   - the applicable unit of measurement is identified in column 2 of Schedule 1
   - additional quantification requirements may be prescribed in the applicable Part of Schedule 3

ii. If the specified industrial activity is not listed in Schedule 1:
   - based on the unit of measurement provided in the request under subsection 172(1) of the Act (Part 2 of the Opt-in Policy)

Electricity generated at an industrial facility must be quantified in accordance with sections 6 and 7 of Part 38 of Schedule 3. However, production can be:

1) Quantified in whole;

2) Quantified in part; or

3) Not quantified.

As per section 15 of Schedule 2 (annual report), a list of equipment from which electricity was generated but not quantified is required.

For the calendar year of 2019, the electricity generated may be quantified in accordance with subsection 9(2) and section 103 of the *Greenhouse Gas Emissions Information Production Order* (Information Order), as it read before August 1, 2019. As per these sections,

i. when only one fossil fuel is used to generate electricity, the production must be quantified with a margin of error of +/-5% and either measured with meters that comply with the requirements of the *Electricity and Gas Inspection Act* and the *Electricity Gas Inspection Regulations*, as per paragraph 103(1)(a) of the Information Order; and

   a. if the facility produces electricity using equipment or stationary items that do not have a meter that complies with those requirements, production of electricity can be quantified by using data recorded in an operations log as long as the given quantity of electricity generated does not exceed 5% of the total electricity generated by the facility; or

   b. Finally, under subsection 103(1.1) of the Information Order, for 2019, the facility must quantify production of electricity using data recorded in an operations log if it meets the following conditions: not having a meter or not having a meter that complies with the requirements of the *Electricity and Gas Inspection Act* and the *Electricity Gas Inspection Regulations*.

ii. when a mixture of fossil fuel and biomass is used to generate electricity, the production must be quantified in accordance with paragraphs 103(2) and (3) of the Information Order with a margin of error of +/-5%.

Furthermore, any production value calculated under section 31 has to be rounded to **three significant figures** as per section 33.

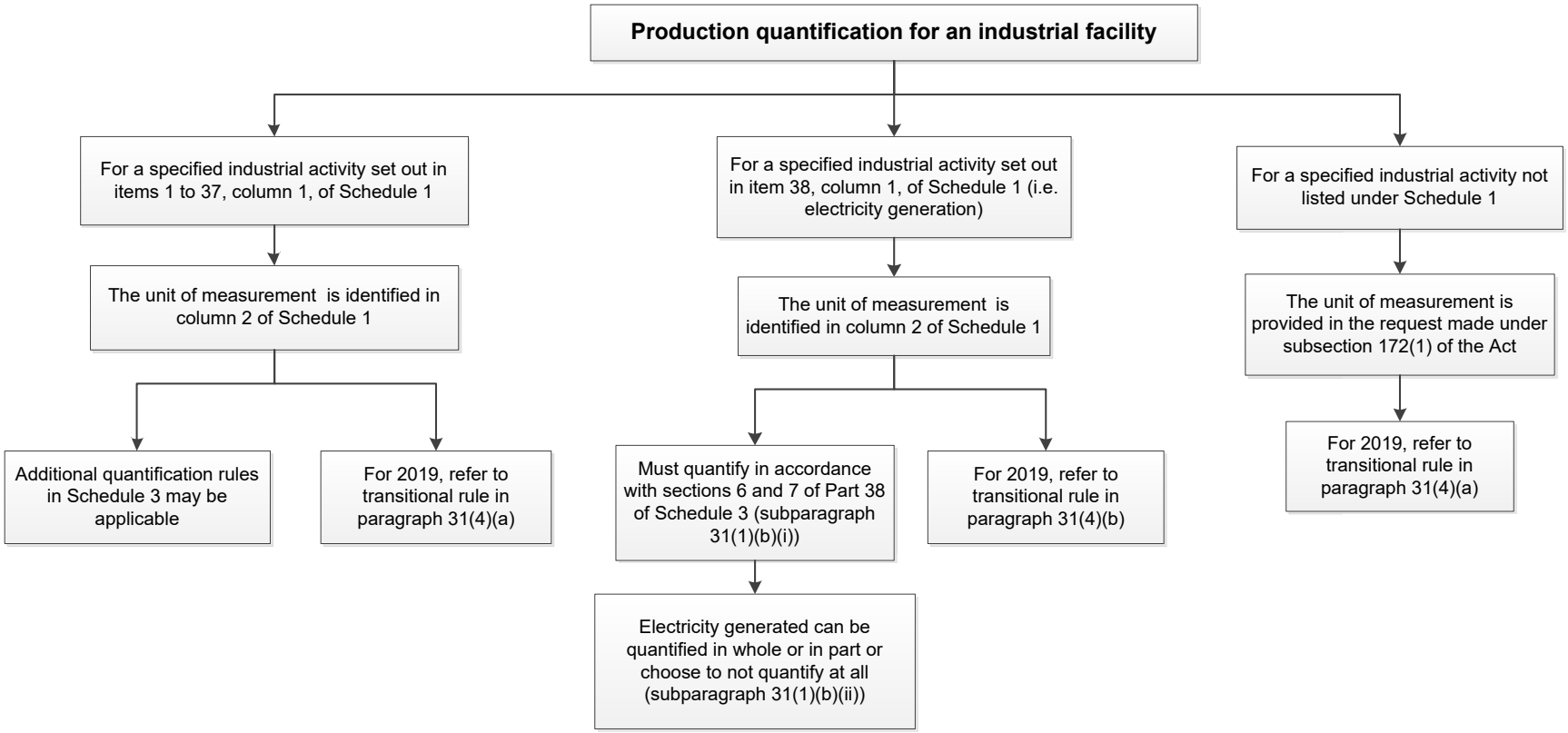


Figure 4: Quantification of production for an industrial facility.

6.1.1. Measuring Device and Engineering Estimates

Measuring devices used to quantify an industrial facility's production must comply with the requirements associated with the measuring device. As per subsection 31(2), any measuring device used to measure production must maintain an accuracy within ± 5% and must also be installed, operated, maintained and calibrated based on the manufacturer's specifications or any applicable generally recognized national or international industry standard. Measuring devices used to measure the production of electricity in these facilities must also comply with the requirements of subsection 31(2).

Where an industrial facility is unable to directly measure their production using a measuring device, production may be quantified using engineering estimates or mass balance, as per subsection 31(3). Subsections 31(2) and 31(3) come into force on January 1, 2020.

For the calendar year of 2019, an industrial facility's production is to be quantified with an accuracy of ± 5% as per paragraph 31(4)(a)**.**

6.2. Quantification of Production for Electricity Generation Facilities

As per subsection 32(1), for an electricity generation facility, production from each unit within the facility must be quantified based on the type of fossil fuel combusted:

1) If the facility uses one fossil fuel (i.e.: natural gas):

    i. The gross electricity generated is determined in accordance with subsection 4(1) of Part 38 of Schedule 3;

    ii. If the facility has a combustion engine unit and a boiler that share the same steam turbine, then the gross electricity generated for each unit is determined as described in section 5 of Part 38 of Schedule 3.

2) If the facility uses a mixture of fossil fuels or a mixture of biomass and fossil fuels:

    i. The gross electricity generated by each fuel type is determined in accordance with subsections 4(2) and (3) of Part 38 of Schedule 3.

    ii. If the facility has a combustion engine unit and a boiler that share the same steam turbine, then the gross electricity generated for each unit is determined as described in section 5 of Part 38 of Schedule 3.

Note, the responsible person may choose not to quantify part or all of the quantity of electricity generated from one unit or a group of units, as per subsection 32(2). As per section 15 of Schedule 2 (annual report), a list of unit(s) is required, from which electricity was generated but not quantified.

Furthermore, any production value calculated under section 32 has to be rounded to **three significant figures** as per section 33.

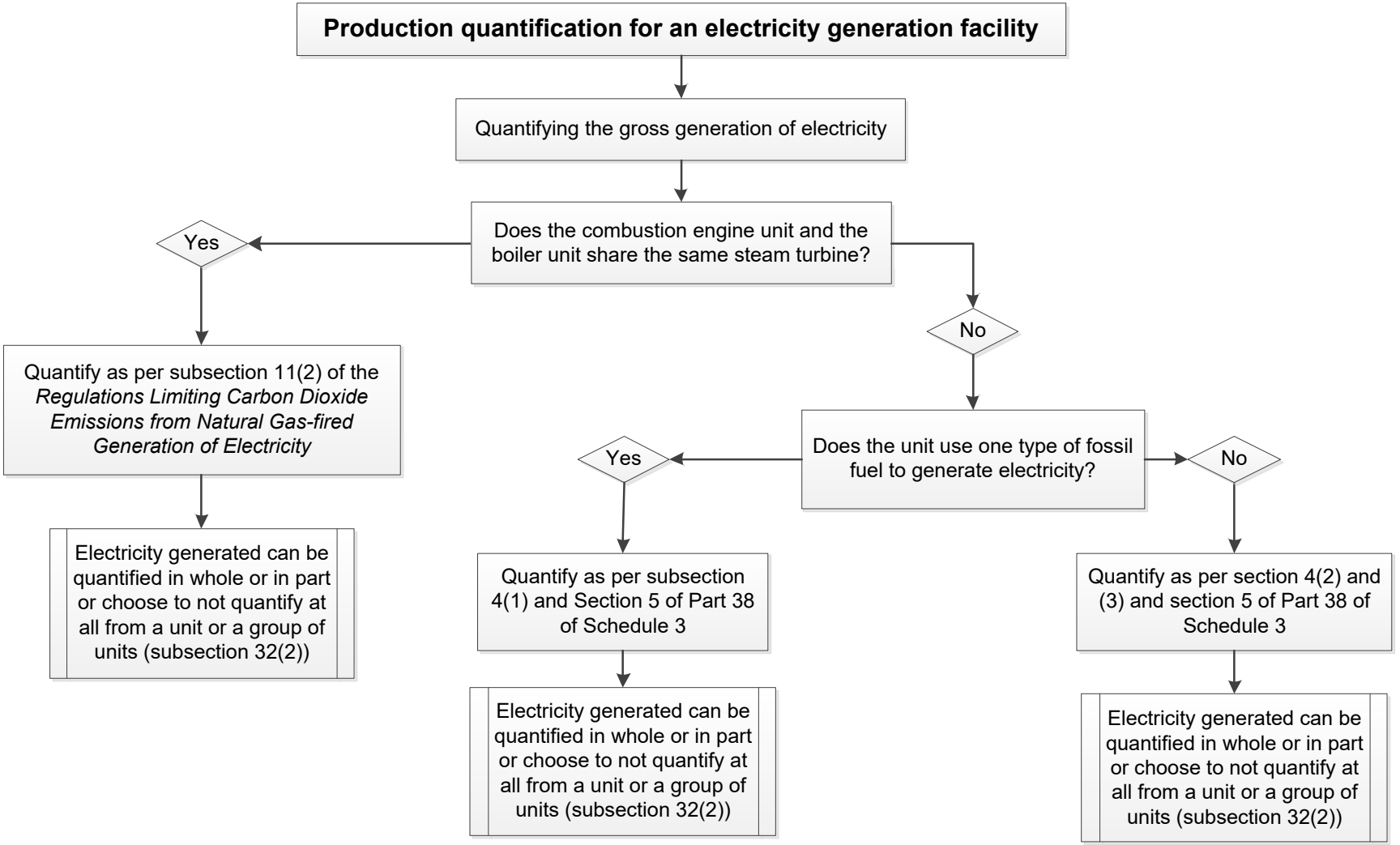


Figure 5: Quantification of production for an electricity generation facility.

6.3. Quantification of Thermal Energy

Thermal energy transfers between covered facilities must be quantified and reported including the ratio of heat from the combustion of fossil fuels associated with those thermal energy transfers. As set out in subsection 34(1), the ratio of heat from the combustion of fossil fuels during a compliance period is either:

i. equal to 1 when the thermal energy is produced from the combustion of **only fossil fuels**; or

ii. is determined by the following formula when the thermal energy is produced from the combustion of **both fossil fuels and biomass**.
   - Refer to Example 6 on how to calculate the ratio of heat from the combustion of both fossil fuels and biomass:

$$\frac{\mathrm{HF}}{\mathrm{HF} + \mathrm{B}}$$

Where
HF is determined by the formula

$$\mathrm{HF} = \sum_{i=1}^{n} \mathrm{QF_i} \times \mathrm{HHV_i}$$

QF_i is the quantity of fossil fuel of type "i" combusted in the facility for the generation of thermal energy during the compliance period, determined in accordance with subsection 7(2) of Part 38 of Schedule 3 for industrial facilities or subsection 4(3) of Part 38 of Schedule 3 for electricity generation facilities,
HHV_i is the higher heating value of the fossil fuel of type "i" combusted in the facility during the compliance period for the generation of thermal energy in accordance with sections 2.C.1 and 2.C.3 of the GHGRP for industrial facilities or subsection 24(1) of the Coal-fired Electricity Regulations for electricity generation facilities, and
i is the i^{th} fossil fuel type combusted in the facility during the compliance period, where "i" goes from 1 to n and where n is the number of types of fossil fuels combusted, and

B is determined by the formula

$$\mathrm{B} = \sum_{k=1}^{n} \mathrm{QBB_k} \times \mathrm{HHV_k}$$

QBB_k is the quantity of biomass fuel type "k" combusted in the facility for the generation of thermal energy during the compliance period, determined in accordance with subsection 7(2) of Part 38 of Schedule 3 and the WCI Method WCI.214 for industrial facilities or subsection 4(3) of Part 38 of Schedule 3 for electricity generation facilities,
HHV_k is the higher heating value for biomass fuel type "k" combusted in the facility during the compliance period for the generation of thermal energy in accordance with sections 2.C.1 and 2.C.3 of the GHGRP and the WCI Method WCI.214 for industrial facilities or subsection 24(1) of the Coal-fired Electricity Regulations for electricity generation facilities, and

k is the k[th] biomass fuel type combusted in the facility during the compliance period, where "k" goes from 1 to m and where m is the number of types of biomass fuels combusted;

Example 6: Thermal Energy

An industrial facility produces thermal energy from the combustion of diesel, heavy fuel oil and pulping liquor fuels. The facility sells the thermal energy to another covered facility subject to the Regulations. The ratio of heat is then calculated using the formula below.

$$\frac{\mathrm{HF}}{\mathrm{HF}+\mathrm{B}}$$

- The value of HF corresponds to the quantity of heat from fossil fuels combustion (i.e.: diesel fuel and heavy fuel oil).
- The value of B corresponds to the quantity of heat from biomass combustion (i.e.: pulping liquor fuel).

1. The value of HF is calculated using the formula below:

$$\mathrm{HF}=\sum_{\mathrm{i}=1}^{\mathrm{n}}\mathrm{QF_i}\times\mathrm{HHV_i}=(\mathrm{QF_1}\times\mathrm{HHV_1})+(\mathrm{QF_2}\times\mathrm{HHV_2})$$

- The value of QF_1 corresponds to 2,000 kL, which is the quantity of diesel fuel.
- The value of HHV_1 corresponds to 38.3 GJ/kL, which is the higher heating value for diesel fuel which was determined in accordance with sections 2.C.1 and 2.C.3 of the GHGRP.
- The value of QF_2 corresponds to 500,000 kL, which is the quantity of heavy fuel oil.
- The value of HHV_2 corresponds to 42.5 GJ/kL, which is the higher heating value for heavy fuel oil which was determined in accordance with sections 2.C.1 and 2.C.3 of the GHGRP.

$$\mathrm{HF}=(\mathrm{QF_1}\times\mathrm{HHV_1})+(\mathrm{QF_2}\times\mathrm{HHV_2})=\left(2{,}000\ \mathrm{kL}\times 38.3\frac{\mathrm{J}}{\mathrm{kL}}\right)+\left(500{,}000\ \mathrm{kL}\times 42.5\frac{\mathrm{J}}{\mathrm{kL}}\right)$$
$$=21{,}326{,}600\ \mathrm{J}$$

2. The value of B is calculated using the formula below:

$$\mathrm{B}=\sum_{\mathrm{k}=1}^{\mathrm{n}}\mathrm{QBB_k}\times\mathrm{HHV_k}=\mathrm{QBB_1}\times\mathrm{HHV_1}$$

- The value of QBB_1 corresponds to 700,000 tonnes, which is the quantity of pulping liquor fuel.

- The value of HHV_1 corresponds to 14.5 MJ/kg, which is the higher heating value for pulping liquor fuel which was determined in accordance with sections 2.C.1 and 2.C.3 of the GHGRP and the WCI. Method WCI.214.

$$B = QBB_1 \times HHV_1 = 700{,}000 \text{ tonnes} \times 14.5 \frac{MJ}{kg} \times \frac{1000 \text{ kg}}{1 \text{ tonne}} \times \frac{1J}{1000MJ} = 10{,}150{,}000 \text{ J}$$

3. Calculate the ratio of heat based on the values determined in steps 1 and 2 :

$$\frac{HF}{HF + B} = \frac{21{,}326{,}600 \text{ J}}{21{,}326{,}600 \text{ J} + 10{,}150{,}000 \text{ J}} = 0.678$$

The industrial facility's ratio of heat from the combustion of fossil fuels is 0.678.

7. DETERMINING THE FACILITY'S EMISSIONS LIMIT

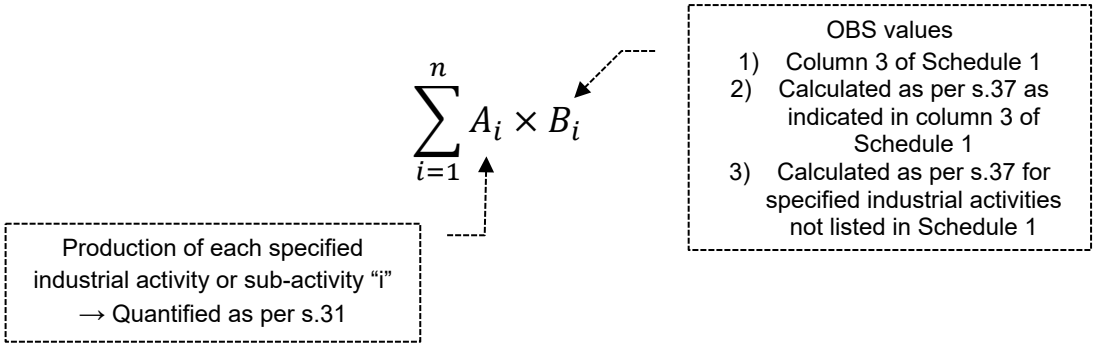
The following sections provide guidance on determining a facility's emissions limit, including the rules for new electricity production from gaseous fuels and calculated OBS, as well as a summary flowchart on these requirements for both industrial and electricity generation facilities.

7.1. Emissions Limit for Industrial Facilities

7.1.1. General Rule

An industrial facility, other than an electricity generation facility, must determine its emissions limit using the formula set out in section 36. The emissions limit is based on the sum of production from all specified industrial activities (as calculated per section 31) multiplied by the applicable OBS. The OBSs are listed in column 3 of Schedule 1. Some OBSs are numerical values while others need to be calculated in accordance with section 37. Special rules may apply for certain specified industrial activities (section 16 and subsections 36(2) to 36(4)) which are identified in the sector specific parts of the document (section 9 of this document).

See below for a breakdown of the emissions limit formula in subsection 36(1).

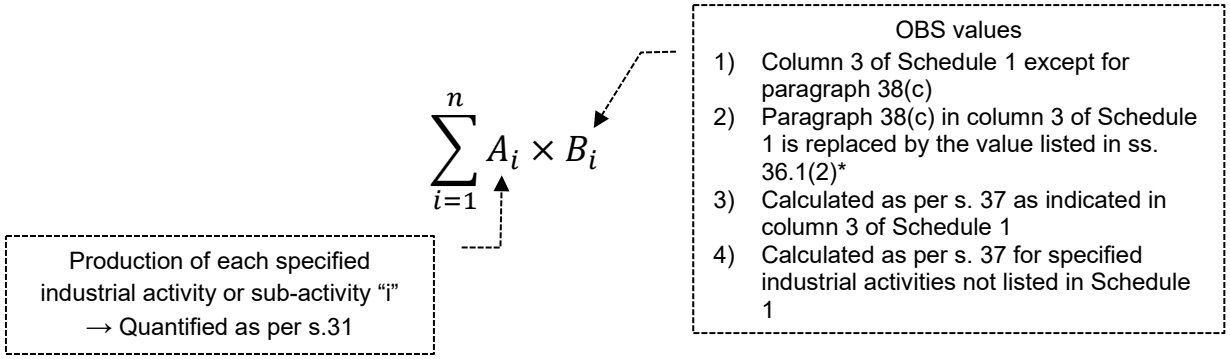


7.1.2. New Generation of Electricity

As described in section 36.1, a facility that begins generating electricity from the combustion of gaseous fuel on or after January 1, 2021 and meets the criteria below must apply the decreasing OBS in subsection 36.1(2) in its emissions limit calculation:

i. the equipment used to produce the new electricity from gaseous fuels has a capacity equal to or greater than 50 MW; and
ii. the equipment is designed to operate at a thermal energy to electricity ratio of less than 0.9

See below for a breakdown of the emissions limit formula in section 36.1.



*The decreasing OBS is not applicable to a facility engaged in the industrial activity under item 20, column 1, of Schedule 1.

7.1.3. Increased Capacity of Electricity Generation

For a facility that, on or after January 1, 2021, increases its electricity generation capacity from the combustion of gaseous fuel by 50MW or more using equipment that has a thermal energy to electricity ratio of less than 0.9, the formula and the decreasing OBS values in subsections 36.2(2) and 36.1(2) must be used to calculate the emissions limit. Note that for an industrial facility, the increase in capacity applies at the facility level and not at the unit level. Refer to the example below on how to calculate the emissions limit in section 36.2 for industrial facilities.

As specified under subsection 36.2(3), the decreasing OBS only applies to the portion of the electricity generation that is attributed to the total incremental capacity added since December 31, 2020. The portion of electricity generation that is attributed to the existing capacity on December 31, 2020 continues to use the OBS set out in column 3 of paragraph 38(c) of Schedule 1 (i.e. 370 tonnes of CO2e/gigawatt hours). As a result, the production of electricity from equipment that has increased its electricity generation capacity and met the criteria in subsection 36.2(1) must be apportioned using engineering estimates as described in subsection 36.2(3). This is refers to the gross amount of electricity generated by the equipment in the description of E and F in subsection 36.2(2).

As per subsection 36.2(4), any increase in the facility's electricity generation capacity is cumulative. Therefore, for a facility that increases its capacity over time, the decreasing OBS

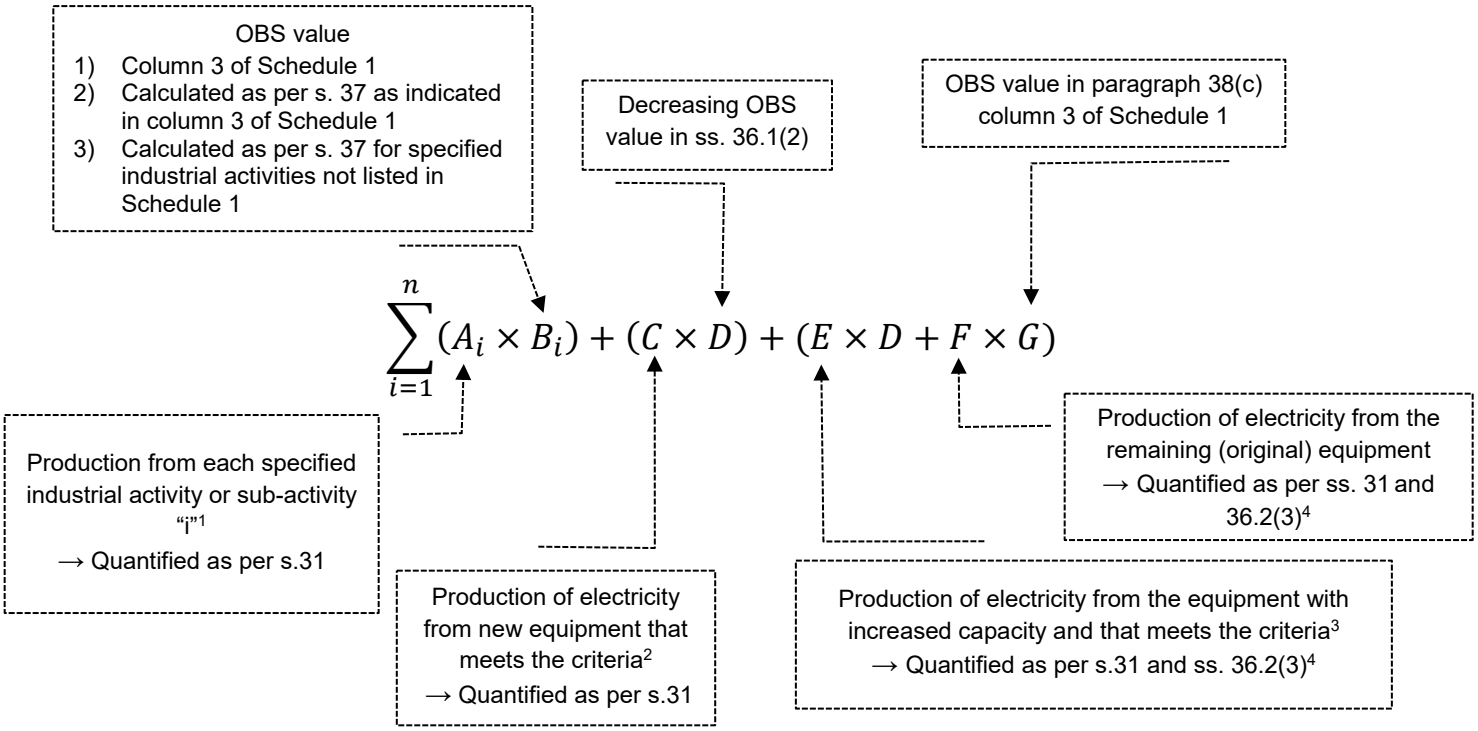
value applies once the facility has reached an increased capacity of 50MW compared to the its capacity on December 31, 2020. Note that the decreasing OBS applies only if the equipment from the increased capacity also has a thermal to electricity ratio of less than 0.9.

Where an industrial facility applies the decreasing OBSs set out in subsection 36.1(2) for a given compliance period, it will continue to apply for all subsequent compliance periods even if:

(a) the facility is not generating electricity from gaseous fuel or the equipment in question has a thermal energy to electricity ratio that is equal to or greater than 0.9 as per section 36.1; or

(b) the equipment in question under section 36.2 is not generating electricity from gaseous fuel or has a thermal energy to electricity ratio that is equal to or greater than 0.9

See below for a breakdown of the emissions limit formula in subsection 36.2(2).



[1] If the facility generates electricity from gaseous fuels (paragraph 38(c) of Schedule 1), then production from equipment described in C, E and F is not included. Electricity production from solid or liquid fuels is represented in A.
[2] The equipment started generating electricity from gaseous fuels on or after January 1, 2021, is designed to operate at a thermal energy to electricity ratio of less than 0.9
[3] The equipment with increased electricity generation capacity that has a thermal energy to electricity ratio of less than 0.9
[4] The gross amount of electricity generated by the equipment referred to in the description of E and F must be apportioned using engineering estimates as specified in subsection 36.2(3).

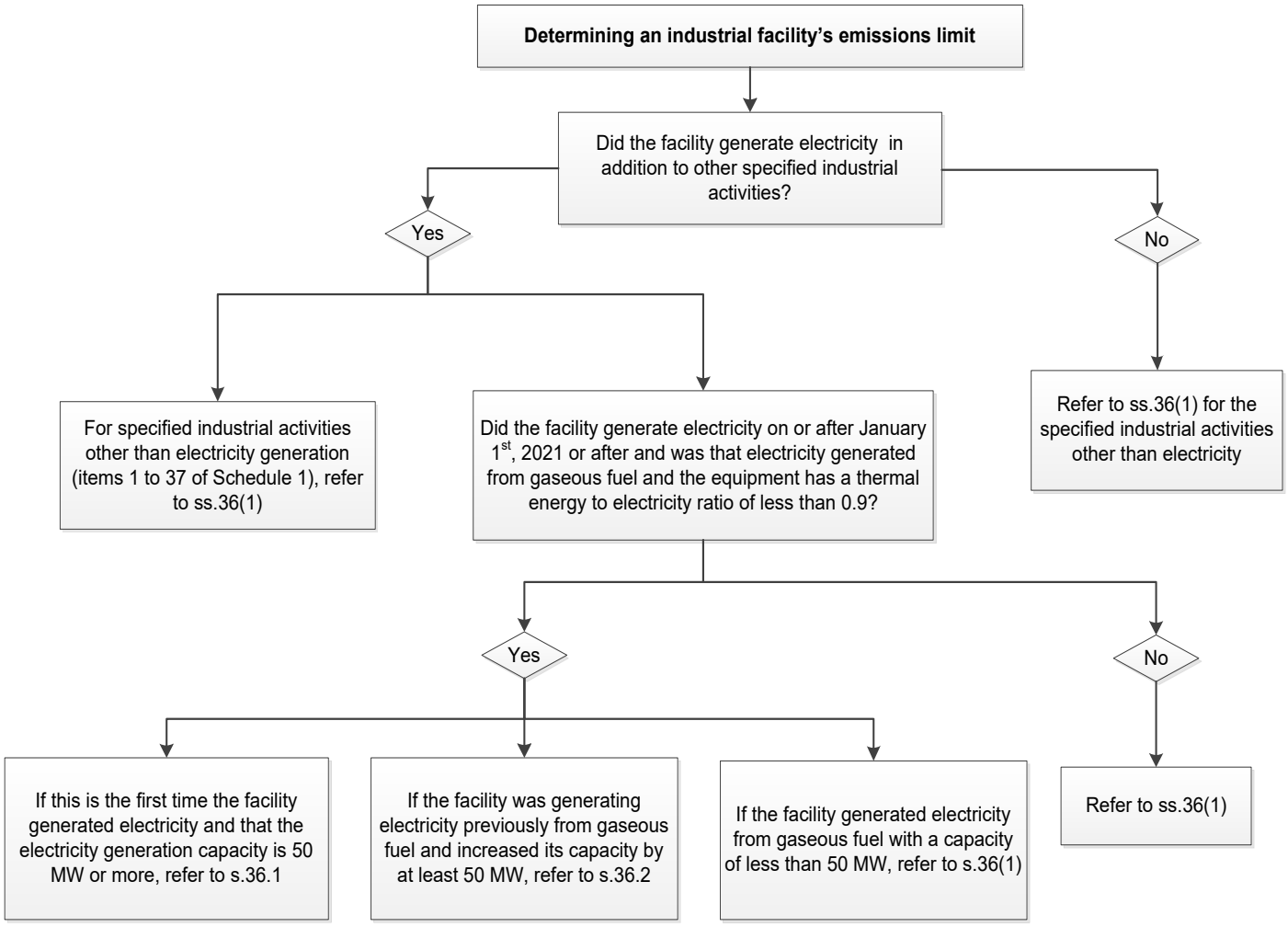


Figure 6: Emissions limit for industrial facilities

Example 7: Emissions limit for increased capacity of electricity generation

An industrial facility, other than an electricity generation facility, produces products 1 and 2, in addition to generating electricity from natural gas. On January 1, 2022, the facility installed a natural gas turbine to increase the capacity of its existing electricity generation equipment by an additional 60 MW. That turbine operates at a thermal energy to electricity ratio of 0.75.

The table below provides the facility's production for all applicable industrial activities and OBSs in order to calculate the facility's emissions limit.

	Production in 2022	Applicable OBSs
Product 1	65,000 tonnes	0.25 tonnes of CO_2e/ tonnes of product 1
Product 2	85,000 tonnes	0.30 tonnes of CO_2e/ tonnes of product 2
Electricity generation	500 GWh	329 and 370 tonnes of CO_2e/gigawatt hours

The facility's emissions limit for the 2022 compliance period must be calculated using the formula below (subsection 36.2(2)) because the electrical capacity was increased by 50 MW or more and that electrical equipment operates at a thermal energy to electricity ratio of less than 0.9.

$$\sum_{i=1}^{n}(A_i \times B_i) + (C \times D) + (E \times D + F \times G)$$
$$= (A_1 \times B_1) + (A_2 \times B_2) + (C \times D) + (E \times D + F \times G)$$

- The values A_1 and A_2 correspond to production of products 1 and 2.
- The values B_1 and B_2 correspond to the OBSs for production of products 1 and 2.
- The value of C corresponds to 0 since the facility did not start generating electricity from the combustion of gaseous fuels on or after January 1, 2021 from equipment that was designed to operate at a thermal energy to electricity ratio of less than 0.9.
- The value of D corresponds to 329 tonnes of CO_2e/GWh, the decreasing OBS for the 2022 compliance period.
- The value of E corresponds to the quantity of electricity generated by the facility that is apportioned based on the capacity of the new turbine relative to the facility's total electricity generation capacity.
- The value of F corresponds to the quantity of electricity generated by the facility that is apportioned based on the capacity of the existing equipment relative to the facility's total electricity generation capacity.
- The value of G corresponds to 370 tonnes of CO_2e/GWh, the applicable OBS for existing equipment that generates electricity from gaseous fuel.

The values of E and F are calculated based on the apportioning of the electricity generation from the new and existing equipment relative to the facility's total electricity generation capacity. The electricity generation capacity from the existing equipment and new turbine are 160 and 60 MW, respectively.

$$\text{new turbine apportioned} = \frac{60\ \text{MW}}{160\ \text{MW} + 60\text{MW}} \approx 0.2727$$

$$\text{existing equipment apportioned } = 1 - 0.2727 \approx 0.7273$$

$$Electricity\ from \text{ new turbine apportioned (variable E)}$$
$$= 0.2727 \times \text{facility's total electricity generation} = 0.2727 \times 500 \text{ Wh}$$
$$= 136.35 \text{ Wh}$$

$$Electricity\ from \text{ existing equipment apportioned (variable F)}$$
$$= 0.7273 \times \text{facility's total electricity generation} = 0.7273 \times 500 \text{ Wh}$$
$$= 363.65 \text{ W h}$$

$$Emissions\ limit = (A_1 \times B_1) + (A_2 \times B_2) + (C \times D) + (E \times D + F \times G)$$
$$= (65{,}000 \times 0.25) + (85{,}000 \times 0.30) + (0 \times 329)$$
$$+ \big((136.35 \text{ Wh} \times 329) + (363.65 \text{ Wh} \times 370)\big)$$

$$= 221{,}160$$

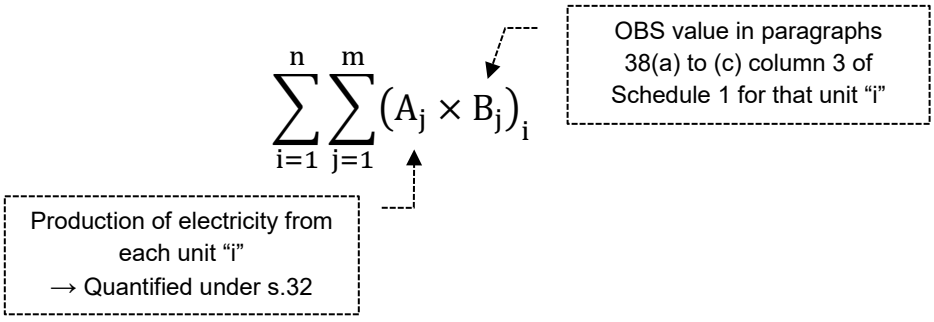
The facility's emissions limit is 221,160 tonnes of CO_2e.

7.2. Emissions Limit for Electricity Generation Facility

7.2.1. General Rule

An electricity generation facility emissions limit must be determined using the formula set out in section 41. An electricity generation facility's emissions limit is based on the sum of the summation, for each unit, of the products of the electricity generated (calculated as per section 32) multiplied by the OBS applicable to the types of fuel used at the unit. However, as per subsection 41(2), if a unit is registered under the Coal-fired Electricity Regulations and has used solid fuel in 2018, the solid fuel OBS must be used regardless of the actual type of fossil fuel used. This includes modified boiler units that burn two fuels such as coal and natural gas or fully converted boilers that only burn natural gas.

See below for a breakdown of the emissions limit formula in subsection 41(1).



7.2.2. New Generation of Electricity

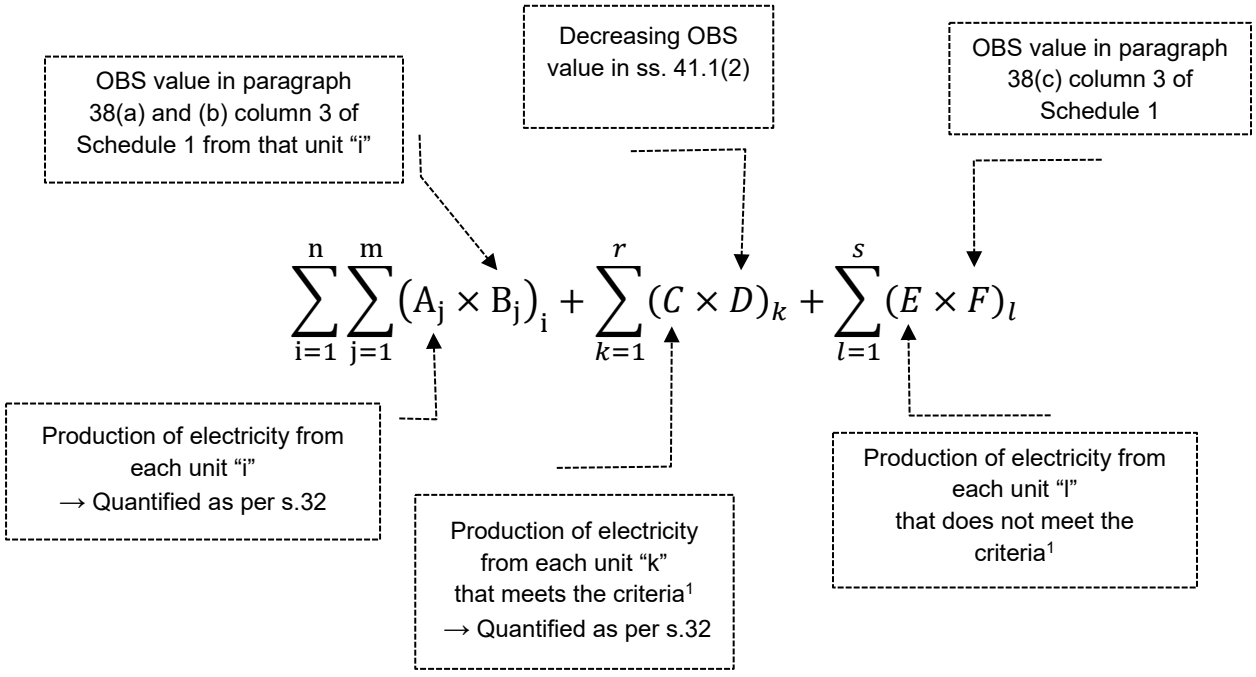
The emissions limit must be calculated using the formula set out in subsection 41.1(2) for a new electricity generation facility that starts generating electricity on or after January 1, 2021 and that also meets the other criteria set out in subsection 41.1(1) and also listed below:

i. The electricity generation facility has at least one unit that is generating electricity using gaseous fuel; and

ii. The unit has a capacity greater or equal to 50MW and is designed to operate at a thermal to electricity ratio of less than 0.9.

If the above criteria are met then, then the emissions limit for the facility must be calculated using the formula set out in subsection 41.1(2) and not the one set out in section 41. The OBS (i.e. decreasing OBS) set out in the description of variable D in subsection 41.1(2) applies instead of the OBS set out in paragraph 38(c) of column 1 of Schedule 1 (i.e. 370 tonnes of CO_2e/gigawatt hours).

See below for a breakdown of the emissions limit formula in subsection 41.1(1).



[1] The unit generates electricity from gaseous fuels, has an electricity generation capacity equal to or greater than 50 MW and is designed to operate at a thermal energy to electricity ratio less than 0.9 on or after January 1, 2021

7.2.3. Increased Capacity of Electricity Generation

For an electricity generation facility that on or after January 1, 2021, increased its electricity generation capacity using gaseous fuel by 50MW or more from a unit designed to operate at a thermal to electricity ratio of less than 0.9, the formula in subsection 41.2(2) and the decreasing OBS set out in the description of D in subsection 41.1(2) must be used. Refer to the example below that illustrates how to calculate the emissions limit for an electricity generation facility that has increased its capacity.

As specified under subsection 41.2(3), the decreasing OBS **only** applies to the portion of the generation from that unit that is attributed to the total incremental capacity added since December 31, 2020. The portion of electricity generation that is attributed to the existing capacity on December 31, 2020 of that unit continues to apply the OBS set out in column 3 of paragraph 38(c) of Schedule 1 (i.e. 370 tonnes of CO_2e/gigawatt hours). As a result, the unit that had an increased electricity generation capacity and met the criteria in subsection 41.2(1) must apportion the gross amount of electricity generated by the unit referred to in the description of E and F in subsection 41.2(2) using engineering estimates.

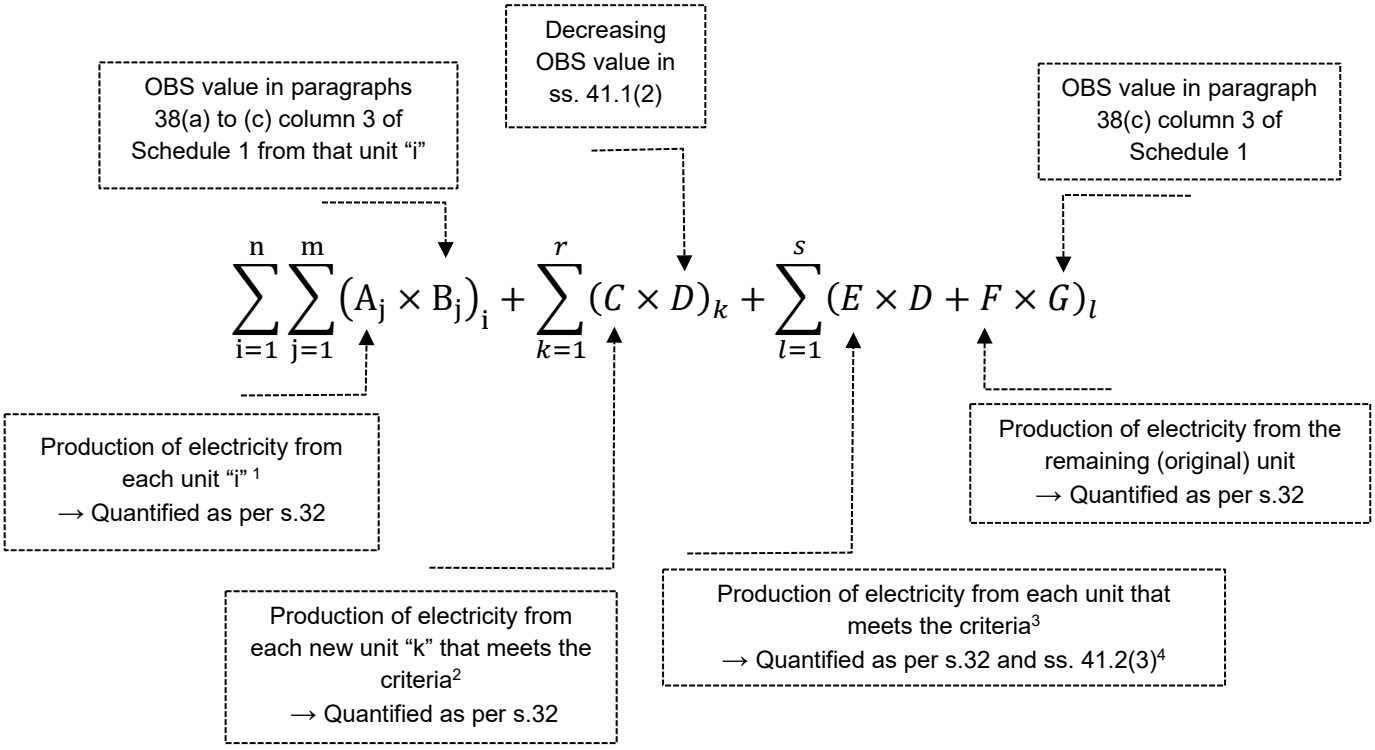
As per subsection 41.2(4), any increase in the unit's electricity generation capacity is cumulative. Therefore, for a unit that increases its capacity over time, the decreasing OBS would apply once the unit has reached an increased capacity of 50MW compared to its capacity on December 31, 2020. Note that the unit in question is designed to operate at a thermal energy to electricity ratio of less than 0.9.

As per section 41.3, where an electricity generation facility generates electricity from gaseous fuel from at least one unit and applies the decreasing OBS set out in subsection 41.1(2) for a previous compliance period, that OBS will continue to apply for all subsequent compliance periods even if:

(a) the unit or group of units is not producing electricity from gaseous fuel; or

(b) is designed to operate at a thermal energy to electricity ratio that is equal to or greater than 0.9.

See below for a breakdown of the emissions limit formula in subsection 41.2(2).



[1] If the unit generates electricity from gaseous fuels (paragraph 38(c) of Schedule 1), then production is from units that were generating electricity prior to the facility's increase in capacity, except the production from the unit described in E or F. Also, production is from a unit that began generating electricity on or after January 1, 2021, if the unit has an electricity generation capacity of less than 50 MW or designed to operate at a thermal energy to electricity ratio equal to or greater than 0.9.
[2] A unit that started generating electricity from gaseous fuels on or after January 1, 2021, that has an electricity generation capacity equal to or greater than 50 MW and is designed to operate at a thermal energy to electricity ratio of less than 0.9.
[3] A unit that generated electricity from gaseous fuels prior to the facility's increase in electricity generation capacity and whose electricity capacity was increased by 50 MW or more and is designed to operate at a thermal energy to electricity ratio of less than 0.9
[4] The gross amount of electricity generated by the equipment referred to in the description of E and F must be apportioned using engineering estimates.

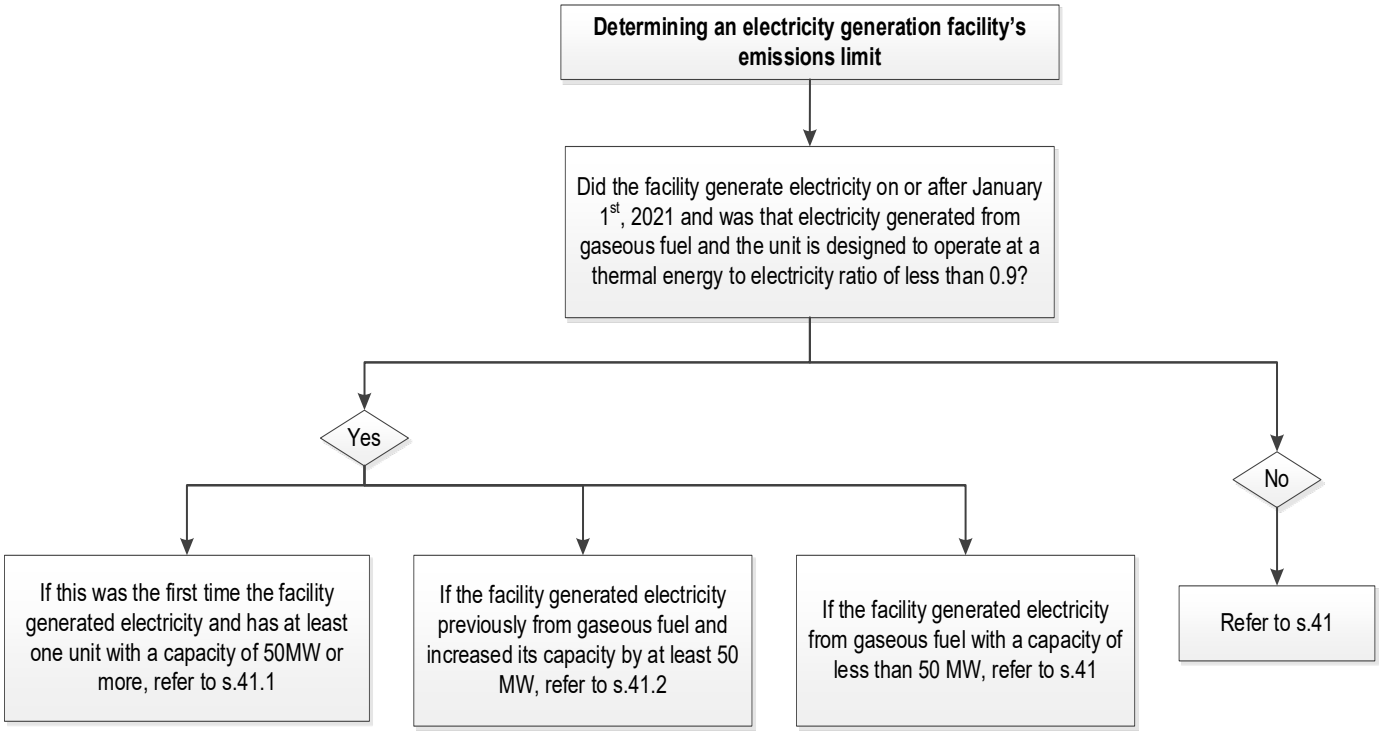


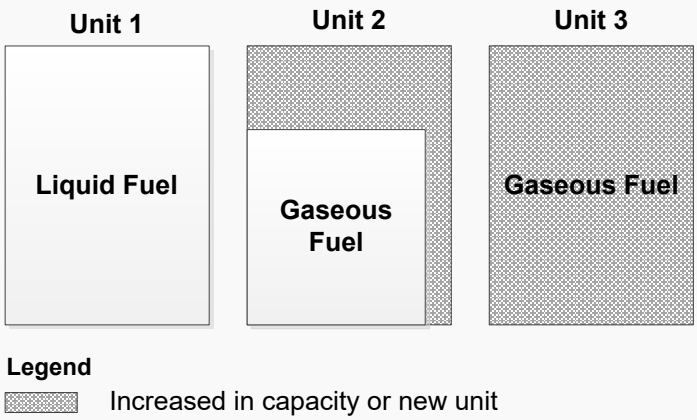
Figure 7: Emissions limit for an electricity generation facility

Example 8: Emissions limit for increased capacity of electricity generation

An electricity generation facility has two units to generate electricity from fossil fuels. Unit 1 uses diesel to generate electricity, while Unit 2 uses natural gas.

In January 2022, the facility installed a new turbine to generate electricity from the combustion of natural gas with a capacity of 60 MW and designed to operate at a thermal energy to electricity ratio of 0.75. The new turbine is integrated with Unit 2.

The facility also built a third unit (Unit 3) in January 2022 that is not integrated with Units 1 and 2. Unit 3 generates electricity from the combustion of natural gas, with a capacity of 80 MW and is designed to operate at a thermal energy to electricity ratio of 0.80. The diagram below shows the configuration of each unit within the facility.



The table below provides the facility's electricity generation from each unit and the applicable OBSs. The facility must calculate the emissions limit for 2022 using the formula below.

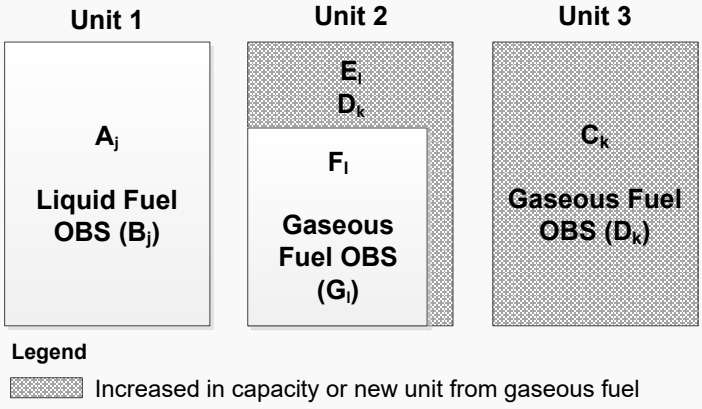
	Production in 2022	Applicable OBSs
Unit 1	600 GWh	550 tonnes of CO_2e/GWh
Unit 2	500 GWh	370 and 329 tonnes of CO_2e/GWh
Unit 3	200 GWh	329 tonnes of CO_2e/GWh

$$\sum_{i=1}^{n}\sum_{j=1}^{m}\left(A_j \times B_j\right)_i + \sum_{k=1}^{r}(C \times D)_k + \sum_{l=1}^{s}(E \times D + F \times \quad)_l$$
$$= [(A_1 \times B_1)_1] + (C_1 \times D_1) + (E_1 \times D_1 + F_1 \times \quad_1)$$
$$= \left(A_{1,1} \times B_{1,1}\right) + (C_1 \times D_1) + (E_1 \times D_1 + F_1 \times \quad_1)$$

- The value of $A_{1,1}$ corresponds to 600 GWh, which is the electricity generated from liquid fuels in Unit 1.
- The value of $B_{1,1}$ corresponds to 550 tonnes of CO_2e/GWh, the applicable OBS for liquid fuels.
- The value of C_1 corresponds to 200 GWh, the gross electricity generation from gaseous fuels in Unit 3.
- The value of D_1 corresponds to 329 tonnes of CO_2e/GWh, the decreasing OBS for the 2022 compliance period.
- The value E_1 corresponds to the quantity of electricity generated by the facility that is apportioned based on the capacity of the new turbine relative to the unit's total electricity generation capacity for Unit 2.
- The value F_1 corresponds to the quantity of electricity generated by the facility that is apportioned based on the capacity of the old equipment relative to the unit's total electricity generation capacity for Unit 2.

- The value G_1 corresponds to 370 tonnes of CO_2e/GWh, the applicable OBS for existing equipment (in place prior to Jan. 1, 2021) that generates electricity from gaseous fuel for Unit 2.

The figure below illustrates how each variable applies to each unit.



1. The values E_1 and F_1 are calculated based on the apportioning of the electricity generation from the new and existing equipment relative to the facility's total electricity generation capacity. The electricity generation capacity from the existing equipment and new turbine are 160 and 60 MW, respectively.

$$\text{new turbine apportioned} = \frac{60\ \text{MW}}{160\ \text{MW} + 60\text{MW}} \approx 0.2727$$

$$\text{existing equipment apportioned } = 1 - 0.272 \approx 0.7273$$

$$\begin{aligned} &Electricity\ from \text{ new turbine apportioned (variable } \mathrm{E}_1) \\ &= 0.2727 \times \text{unit's total electricity generation} = 0.2727 \times 500\ \text{Wh} \\ &= 136.35\ \text{Wh} \end{aligned}$$

$$\begin{aligned} &Electricity\ from \text{ existing equipment apportioned (variable } \mathrm{F}_1) \\ &= 0.7273 \times \text{facility's total electricity generation} = 0.7273 \times 500\ \text{Wh} \\ &= 363.65\ \text{Wh} \end{aligned}$$

$$Emissions\ limit = \left(A_{1,1} \times B_{1,1}\right) + (C_1 \times D_1) + (\mathrm{E}_1 \times \mathrm{D}_1 + \mathrm{F}_1 \times \ _1)$$

$$= (600 \times 550) + (200 \times 329) + (136.35 \times 329 + 363.65 \times 370) = 575{,}210$$

The electricity generation facility's emissions limit is 575,210 tonnes of CO_2e.

7.3. New covered facilities

As set out in section 43, an exception applies in regards to the calculation of a new covered facility's emissions limit. An emissions limit calculation is not required if, on January 1 of a compliance period, the facility has not completed two full calendar years of production following the date of first production, and the facility's primary activity is a specified industrial activity. The date of first production is the date on which the facility became engaged in any industrial activity.

The exception above does not apply to a new electricity generation facility that begins generating electricity on or after January 1, 2021.

7.4. Calculated OBS

Certain specified industrial activities require an OBS to be calculated using the formula in subsection 37(1). The result from the calculation of the OBS must be rounded to three significant figures as per subsection 37(4). There are three general cases described below to provide information on when the person responsible for a facility is required to calculate their OBS.

7.4.1. Case 1: Existing facilities engaged in Schedule 1 activities

This case applies to facilities already in operation and engaged in one or more industrial activities listed in column 1 of Schedule 1 and where column 3 of Schedule 1 specifies that the OBS must be calculated in accordance with section 37.

The formula to calculate an OBS is described in subsection 37(1). For facilities in operation prior to 2017, engaged in industrial activities listed in column 1 of Schedule 1, the reference years to be used in the calculation are described in paragraph 37(2)(a), which indicates that facilities may use either 2017 and 2018 as the reference years, or the compliance period, as illustrated in the example below. However, for new covered facilities, refer to Case 2 for further details.

For a facility engaged in the production of steel in an electric arc furnace as per paragraph 20(d), column 1 of Schedule 1, refer to section 9.4.2.2 of this document.

In determining the emissions limit, as described in subsection 36(5), the OBS is only to be calculated once for the first annual report. The exception to this is in section 39, which applies where the OBS was calculated for a compliance period that started after January 1st of a given year (i.e. partial compliance period).

Example 9: Calculated OBS for Case 1

A facility that is engaged in Schedule 1 activities produces products 1, 2 and 3, in addition to generating electricity. The facility has numerical OBSs for producing products 1 and 2 but an OBS must be calculated for the production of product 3. The 2017 and 2018 calendar years were chosen as the reference years for calculating the OBS. The table below provides the quantity of GHGs and production information for the facility for the years 2017 and 2018.

	Quantity of GHGs in 2017 (tonnes of CO_2e)	Quantity of GHGs in 2018 (tonnes of CO_2e)	Production in 2017	Production In 2018
Product 1	2,000,000	2,500,000	50,000 tonnes	55,000 tonnes
Product 2	2,500,000	3,000,000	60,000 tonnes	65,000 tonnes
Product 3	3,500,000	4,000,000	70,000 tonnes	75,000 tonnes
Electricity generation	1,000,000	1,500,000	2,500 GWh	3,750 GWh
Facility's total	**9,000,000**	**11,000,000**	**-**	**-**

The facility calculates the OBS for the production of product 3 using the following formula, as set out in subsection 37(1):

$$\frac{\sum_{i=1}^{n}(A-B-C)_i}{\sum_{i=1}^{n} D_i} \times E = \left[\frac{(A-B-C)_{2017}+(A-B-C)_{2018}}{D_{2017}+D_{2018}}\right] \times E$$

- The values for A correspond to 9,000,000 and 11,000,000 tonnes of CO_2e for 2017 and 2018, respectively, and are the facility's total quantity of GHGs.
- The value B corresponds to zero because the facility did not purchase or sell thermal energy.
- The value C correspond to the total quantity of GHGs associated with the production of products 1 and 2, and the generation of electricity. This parameter does not include the quantity of GHGs associated with the production of product 3. The values are 5,500,000 and 7,000,000 for 2017 and 2018 respectively.
- The value D corresponds to 70,000 and 75,000 tonnes of product 3 in 2017 and 2018, respectively, and is the total production for the OBS that is being calculated.
- In this case, the value E corresponds to 80%. Subsection 37(1) sets out the values for E by industrial activity.

$$\left[\frac{(A-B-C)_{2017}+(A-B-C)_{2018}}{D_{2017}+D_{2018}}\right] \times E$$

$$= \left[\frac{(9{,}000{,}000-0-5{,}500{,}000)+(11{,}000{,}000-0-7{,}000{,}000)}{(70{,}000+75{,}000)}\right] \times 0.80$$

$$= 41.38 \frac{\text{tonnes of } CO_2e}{\text{tonnes of product 3}}$$

The OBS for production of product 3 is 41.4 tonnes of CO_2e/tonnes of product 3, which is rounded to three significant figures. The OBS value is only calculated once for the first annual report.

7.4.2. Case 2: New covered facility engaged in an activity listed in Schedule 1

A facility engaged in an industrial activity listed in column 1 of Schedule 1 and that is subject to the provisions related to new covered facilities specified in section 43, is subject to specific rules related to reference years for the calculated OBS. For these facilities, pursuant to subsection 37(2), the reference years are either:

> **(i)** the two calendar years before the compliance period for which the emissions limit is calculated, if the data is available for those years,
>
> **(ii)** the calendar year before the compliance period for which the emissions limit is calculated, if the data is not available for the two calendar years referred to in (i), or
>
> **(iii)** the compliance period for which the emissions limit is being calculated, if data is not available for the preceding calendar years.

Example 10: Calculated OBS for Case 2

A new covered facility engaged in an industrial activity listed in column 1 of Schedule 1 and where a calculated OBS is required, will calculate the OBS for the given industrial activity based on the same calculations as Case 1. However, there are specific rules related to reference years when calculating the OBS for a new facility.

For example, a new facility was never engaged in an industrial activity before it began operations on June 1st, 2019. This means on January 1st of 2020 and on January 1st of 2021, the facility will not have completed two full calendar years of production following the date of first production. Therefore, for the 2019, 2020 and 2021 compliance periods, the emissions limit is not calculated (i.e. sections 36 to 42 do not apply). The first compliance period for which an emissions limit is to be calculated is from January 1 to December 31, 2022, and the facility may use the reference year according to the following scenarios in the annual report for the 2022 compliance period:

Scenario 1:

- Date facility opts-in: June 1st, 2019
- Annual reports available for compliance periods: 2019 (partial), 2020, 2021 and 2022
- Annual reports submitted prior to 2022 without an emissions limit as per 11(1)(e) and (f): 2019 (partial year), 2020 and 2021
- Reference years to be used in the calculation of the OBS: 2020 and 2021, as per subparagraph 37(2)(b)(i)

Scenario 2:

- Date facility opts-in: June 1st, 2020
- Annual reports available for compliance periods: 2020 (partial), 2021 and 2022
- Annual reports submitted prior to 2022 without an emissions limit as per 11(1)(e) and (f): 2020 (partial year), 2021

- Reference years to be used in the calculation of the OBS: 2021, as per subparagraph 37(2)(b)(ii)

Scenario 3:

- Date facility opts-in: June 1st, 2021
- Annual reports available for compliance periods: 2021 (partial) and 2022
- Annual reports submitted prior to 2022 without an emissions limit as per 11(1)(e) and (f): 2021 (partial year)
- Reference years to be used in the calculation of the OBS: 2022, as per subparagraph 37(2)(b)(iii)

Scenario 4:

- Date facility opts-in: June 1st, 2022
- Annual reports available for compliance period: 2022 (partial)
- Annual reports submitted prior to 2022 without an emissions limit as per 11(1)(e) and (f): None
- Reference years to be used in the calculation of the OBS: 2022, as per subparagraph 37(2)(a)(ii)
- The OBS is to be recalculated for the following compliance period using a full calendar year of data (2023), as per section 39.

7.4.3. Case 3: Facilities engaged in activities not listed in Schedule 1

This case applies to a facility that submitted a request under subsection 172(1) of the Act to be designated as a covered facility (opt-in) and is engaged in an activity that is described in subparagraph 5(2)(b)(ii), and that activity is not listed in column 1 of Schedule 1. This activity is specified in the notice provided by the Minister that accompanies the covered facility certificate. For further details on the considerations that are to be taken into account when a designation is made under section 172 of the Act, including the determination of eligible activities, see the Opt-in policy.

For these facilities, in accordance with section 40, the information used in the calculation of the OBS must be the same information provided in the request for designation. This also applies to new facilities engaged in activities not listed in Schedule 1. Note, section 48 requires that written notification be provided to the Minister within 30 days after a change to the information provided in a request for designation under subsection 172(1) of the Act, that could include changes to emissions and production included in the application.

Example 11: Calculated OBS for Case 3

A facility that produces product A from an industrial activity that is not listed in Schedule 1. The facility also generates electricity from fossil fuels and produces thermal energy from the combustion of fossil fuel, and sells it to another covered facility.

The table below outlines the quantity of GHGs and production information provided by the facility when it made its request for designation as a covered facility.

	Quantity of GHGs in 2017 (tonnes of CO_2e)	Quantity of GHGs in 2018 (tonnes of CO_2e)	Production in 2017	Production In 2018
Product A	30,000	35,000	65,000 tonnes	70,000 tonnes
Thermal energy sold	Included in the quantity of GHGs for Product A	Included in the quantity of GHGs for Product A	30,000 GJ	35,000 GJ
Electricity generated	10,000	12,500	30 GWh	35 GWh
Facility's total	40,000	47,500		

The formula below calculates the OBS for the production of product A :

$$\frac{\sum_{i=1}^{n}(A-B-C)_i}{\sum_{i=1}^{n} D_i} \times E = \left[\frac{(A-B-C)_{2017}+(A-B-C)_{2018}}{D_{2017}+D_{2018}}\right] \times E$$

- The value A corresponds to 40,000 and 47,500 tonnes of CO_2e for the 2017 and 2018 calendar years, respectively, which is the facility's total quantity of GHGs.
- The value C corresponds to 10,000 and 12,500 tonnes of CO_2e for 2017 and 2018 calendar year, respectively, which is the total quantity of GHGs from the generation of electricity.
- The value D corresponds to 65,000 and 70,000 for 2017 and 2018 calendar year, respectively, which is the total facility's production for product A.
- The value E corresponds to 80%, which is the prescribed GHG emissions reduction factor for all specified industrial activities not listed in Schedule 1.
- The value B is the net thermal energy, this value is calculated using the formula below.

The formula below calculates the net thermal energy (the value of B) of the facility for 2017 and 2018.

$$0.062 \text{ tonnes of } CO_2e \text{ / gigajoules} \times (M-N) \times O$$

- The value M corresponds to 30,000 GJ and 35,000 GJ for 2017 and 2018 calendar year, respectively, which is the quantity of thermal energy sold based on the sales receipts.

- The value N corresponds to 0 GJ because the facility did not buy any thermal energy from another covered facility subject to the Regulations.
- The value O corresponds to 1 because the facility produces thermal energy from the combustion of fossil fuels only.

$$For\ 2017: 0.062 \frac{\text{tonnes of } CO_2e}{\text{GJ}} \times (30{,}000\ \text{J} - 0\ \text{J}) \times 1 = 1{,}860\ \text{tonnes of } CO_2e$$

$$For\ 2018: 0.062 \frac{\text{tonnes of } CO_2e}{\text{GJ}} \times (35{,}000\ \text{J} - 0\ \text{J}) \times 1 = 2{,}170\ \text{tonnes of } CO_2e$$

B is equal to zero if the quotient obtained by dividing the sum of the results determined using the formula above for each reference year "i" by the number of reference years is less than the quotient obtained by dividing the result of the formula below by the number of reference years.

$$\sum_{i=1}^{n} 0.015 \times A_i = (0.015 \times A_1) + (0.015 \times A_2)$$
$$= (0.015 \times 40{,}000) + (0.015 \times 47{,}500) = 1{,}312.50$$

Evaluate if B is equal to zero

$$\frac{(1{,}860 + 2{,}170)}{2} \geq \frac{1{,}312.50}{2}$$

$$2{,}015 \geq 656$$

Since 2,015 is not less than 656, the value of B is not equal to 0. The value B is 1,860 and 2,170 tonnes of CO_2e for 2017 and 2018, respectively.

Therefore, the OBS value is calculated by:

$$\left[\frac{(A - B - C)_{2017} + (A - B - C)_{2018}}{D_{2017} + D_{2018}}\right] \times E$$
$$= \left[\frac{(40{,}000 - 1{,}860 - 10{,}000) + (47{,}500 - 2{,}170 - 12{,}500)}{(65{,}000 + 70{,}000)}\right] \times 0.80$$
$$= 0.3613 \frac{\text{tonnes of } CO_2e}{\text{tonnes of product A}}$$

The OBS for the production of product A is 0.361 tonnes of CO_2e/tonnes of product A. Note, the OBS value is calculated only once.

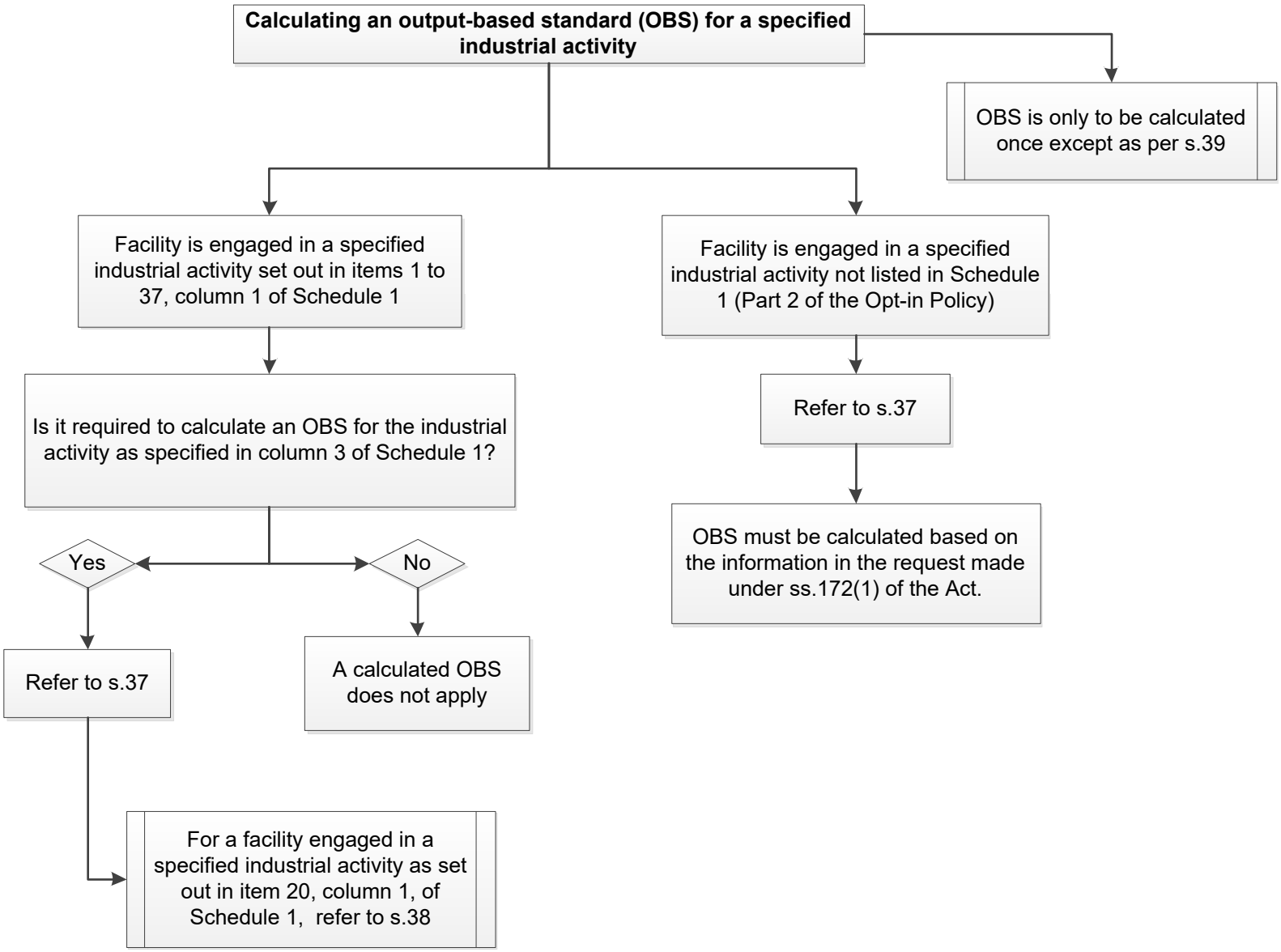


Figure 8: For a facility that is required to calculate an OBS.

8. QUANTIFICATION REFERENCES BY SECTOR

Table 2: Quantification references in the Regulations by sector

Sector	Column 1	Column 2	Column 3
	Quantification of GHGs	**Quantification of Production**	**Additional Rules for Quantification and Reporting**
All, except electricity generation facilities	Sections 17 to 19, 22 to 25 and 35	Sections 31 and 33	Subsection **16(1)**
Oil and Gas Production			
Bitumen and Other Crude Oil Production	Part 1 of Schedule 3	Item 1 of Schedule 1	N/A
Bitumen or Heavy Oil Upgrading	Part 2 of Schedule 3	Item 2 of Schedule 1	Subsections **12(2), 16(3)** and section **79**
Petroleum Refining	Part 3 of Schedule 3	Item 3 of Schedule 1 Division 2, Part 3 of Schedule 3	Subsections **16(2), 16(3), 16(9),** sections **79** and **85**
Natural Gas Processing	Part 4 of Schedule 3	Item 4 of Schedule 1 Division 2, Part 4 of Schedule 3	Subsection **16(9)**
Natural Gas Transmission	Part 5 of Schedule 3	Item 5 of Schedule 1 Division 2, Part 5 of Schedule 3	N/A
Hydrogen Gas Production	Part 6 of Schedule 3	Item 6 of Schedule 1	N/A
Mineral Processing			
Cement and Clinker Production	Part 7 of Schedule 3	Item 7 of Schedule 1 Division 2, Part 7 of Schedule 3	Section **82** and item 11 of Schedule 2
Lime Manufacturing	Part 8 of Schedule 3	Item 8 of Schedule 1 Division 2, Part 8 of Schedule 3	N/A
Glass Manufacturing	Part 9 of Schedule 3	Item 9 of Schedule 1	Section **83**
Gypsum Product Manufacturing	Part 10 of Schedule 3	Item 10 of Schedule 1	Subsection **12(2)**
Mineral Wool Insulation Manufacturing	Part 11 of Schedule 3	Item 11 of Schedule 1	N/A
Brick Production	Part 12 of Schedule 3	Item 12 of Schedule 1	N/A
Chemicals			
Ethanol Production	Part 13 of Schedule 3	Item 13 of Schedule 1	Subsection **36(2)**
Furnace Black Production	Part 14 of Schedule 3	Item 14 of Schedule 1	N/A

Sector	Column 1	Column 2	Column 3
	Quantification of GHGs	**Quantification of Production**	**Additional Rules for Quantification and Reporting**
2–methylpentamethylenediamine (MPMD) Production	Part 15 of Schedule 3	Item 15 of Schedule 1	Subsection **16(3)**
Nylon Production	Part 16 of Schedule 3	Item 16 of Schedule 1	N/A
Petrochemicals Production	Part 17 of Schedule 3	Item 17 of Schedule 1	Subsection **16(2),** section **84** and item 12 of Schedule 2
Pharmaceuticals			
Vaccine Production	Part 18 of Schedule 3	Item 18 of Schedule 1 Schedule 3, Division 2	N/A
Iron, Steel and Metal Tubes			
Scrap-based Steel Production	Part 19 of Schedule 3	Item 19 of Schedule 1	Subsection **16(4)**
Integrated Steel Production	Part 20 of Schedule 3	Item 20 of Schedule 1	Subsections **16(4)**, **16(5)** and **16(6)**
Iron Ore Pelletizing	Part 21 of Schedule 3	Item 21 of Schedule 1	N/A
Metal Tube Manufacturing	Part 22 of Schedule 3	Item 22 of Schedule 1	N/A
Mining and Ore Processing			
Base Metal Production	Part 23 of Schedule 3	Item 23 of Schedule 1	Subsection **16(7)** and section 13 of Schedule 2
Potash Production	Part 24 of Schedule 3	Item 24 of Schedule 1	N/A
Coal Mining	Part 25	Item 25 of Schedule 1	Subsection **11(c)** and Section **1** of Part 25 of Schedule 3
Production of Metals or Diamonds	Part 26 of Schedule 3	Item 26 of Schedule 1	Subsections **16(8)** and **16(9)**
Char Production	Part 27 of Schedule 3	Item 27 of Schedule 1	N/A
Activated Carbon Production	Part 28 of Schedule 3	Item 28 of Schedule 1	N/A
Nitrogen Fertilizers			
Nitrogen-based Fertilizer Production	Part 29 of Schedule 3	Item 29 of Schedule 1	Subsections **16(3)** and **36(4)**
Food Processing			
Industrial Potato Processing	Part 30 of Schedule 3	Item 30 of Schedule 1	N/A
Industrial Oilseed Processing	Part 31 of Schedule 3	Item 31 of Schedule 1	Subsection **36(3)**
Alcohol Production	Part 32 of Schedule 3	Item 32 of Schedule 1	N/A
Wet Corn Milling	Part 33 of Schedule 3	Item 33 of Schedule 1	N/A

Sector	Column 1	Column 2	Column 3
	Quantification of GHGs	**Quantification of Production**	**Additional Rules for Quantification and Reporting**
Citric Acid Production	Part 34 of Schedule 3	Item 34 of Schedule 1	N/A
Sugar Refining	Part 35 of Schedule 3	Item 35 of Schedule 1	N/A
Pulp and Paper Production	Part 36 of Schedule 3	Item 36 of Schedule 1 Schedule 3 Part 36, Division 2	Section **85.1**
Automotive Production	Part 37 of Schedule 3	Item 37 of Schedule 1 Schedule 3 Part 37, Division 2	N/A
Electricity Generation			
Industrial facilities	Part of Schedule 3 that is applicable to the industrial activity*	Item 38 of Schedule 1 Schedule 3 Part 38 Sections 6 and 7	Sections **36.1** and **36.2**, section 15 of Schedule 2
Electricity generation facilities	Sections 20 to 25 Part 38 of Schedule 3	Sections 32 and 33 Item 38 of Schedule 1 Schedule 3 Part 38 Sections 4 and 5	Sections **41.1** and **41.2**, sections 14 to 17 of Schedule 2

* For a facility referred to in paragraph 5(2)(c), quantification is made in accordance with section 19.

9. SECTOR SPECIFIC PARTS

The following sections provide additional guidance on quantification of emissions and production and reporting requirements for sectors with additional quantification and reporting rules as listed under column 3 of Table 2 of this document. This section only applies to sectors or industrial activities for which there are special or additional requirements. The sections below also provide certain calculation examples.

9.1. Oil and Gas Production

This section outlines quantification provisions set out in sections 12 and 16 and transitional provisions that apply specifically to facilities engaged in bitumen or heavy oil upgrading, petroleum refining, natural gas processing, and natural gas transmission (items 2, 3, 4, and 5 column 1, of Schedule 1).

9.1.1. Bitumen or Heavy Oil Upgrading (item 2 of Schedule 1)

9.1.1.1. Additional reporting – Hydrogen gas

As part of the annual report (subsection 12(3)), if a facility engaged in the upgrading of bitumen or heavy oil also produces hydrogen gas, the quantity of hydrogen gas produced and sold in tonnes must be included in the annual report. However, the transitional provision under section 79 states that for 2019 calendar year only, the quantities of hydrogen gas produced and sold are only to be reported if the information is available.

9.1.1.2. Additional production

Subsection 16(3): Additional production of hydrogen gas

Quantification of GHGs	Paragraph 16(3)(a) • For the purposes of section 17, quantify GHGs arising from the production of hydrogen gas using quantification methods applicable to bitumen or heavy oil upgrading (Part 2 of Schedule 3 and paragraph 17(2)(b), as applicable).
Quantification of Production	Paragraph 16(3)(b) • Production of hydrogen gas has to be quantified and reported in the annual report as per subsection 12(3). • The facility is deemed not to be engaged in the production of hydrogen gas and petrochemicals for the purposes of calculating the emissions limit. ○ The OBSs for the production of hydrogen gas (item 6 of Schedule 1) and production of petrochemicals (item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.1.2. Petroleum Refining (item 3 of Schedule 1)

9.1.2.1. Quantification of production

The quantity of complexity weighted-barrels is to be quantified in accordance with Division 2 of Part 3 of Schedule 3.

9.1.2.2. Additional reporting – Hydrogen gas

As part of the annual report (subsection 12(3)), if a facility that is engaged in petroleum refining also produces hydrogen gas, the quantity of hydrogen gas produced and sold in tonnes, must be included in the annual report. However, the transitional provision under section 79 states that for the 2019 calendar year only, the quantities of hydrogen gas produced and sold are only to be reported if the information is available.

9.1.2.3. Additional production

Subsection 16(2): Additional production of natural gas liquids

Quantification of GHGs	Paragraph 16(2)(a) • For the purposes of section 17, quantify GHGs arising from the production of natural gas liquids using quantification methods applicable to petroleum refining (Part 3 of Schedule 3 and paragraph 17(2) (b), as applicable).

Quantification of Production	Paragraph 16(2)(b)
	• The facility is deemed not to be engaged in the production of natural gas liquids for the purposes of quantifying production and calculating the emissions limit.
	  ○ Production of natural gas liquids is not required to be quantified or reported; and
	  ○ The OBS for the production of natural gas liquids (paragraph 4(b) of Schedule 1) cannot be used in the calculation of the emissions limit.

Subsection 16(3): Additional production of hydrogen gas

Quantification of GHGs	Paragraph 16(3)(a) • For the purposes of section 17, quantify GHGs arising from the production of hydrogen gas using quantification methods applicable to petroleum refining (Part 3 of Schedule 3 and paragraph 17(2) (b), as applicable).

Quantification of Production	Paragraph 16(3)(b) • Production of hydrogen gas has to be quantified and reported in the annual report as per subsection 12(3). • The facility is deemed not to be engaged in the production of hydrogen gas for the purposes of calculating the emissions limit. ○ The OBS for the production of hydrogen gas (item 6 of Schedule 1) cannot be used in the calculation of the emissions limit.

Subsection 16(9): Additional production of petrochemicals

Quantification of GHGs	Paragraph 16(9)(a) • For the purposes of section 17, quantify GHGs arising from the production of petrochemicals using quantification methods applicable to petroleum refining (Part 3 of Schedule 3 and paragraph 17(2) (b), as applicable).

Quantification of Production	Paragraph 16(9)(b)
	• The facility is deemed not to be engaged in the production of petrochemicals for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of petrochemicals is not to be quantified or reported; and
	  ○ The OBS for the production of petrochemicals (item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.1.2.4. Calculated OBS

For a facility that produces isopropyl alcohol (paragraph 3(c) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.1.2.5. Transitional provision – Isopropyl alcohol

As set out in section 85, for the 2019 calendar year only, the production of isopropyl alcohol is not required to be quantified for a facility engaged in the production of isopropyl alcohol. However, all the GHGs arising from the production of isopropyl alcohol must still be quantified and included in the facility's total quantity of GHGs. For the 2020 calendar year and beyond, production of isopropyl alcohol must be quantified as per section 31.

9.1.3. Natural Gas Processing (item 4 of Schedule 1)

9.1.3.1. Quantification of production – Natural gas liquids

The quantity of natural gas liquids produced is quantified in accordance with Division 2 of Part 4 of Schedule 3.

9.1.3.2. Additional production

Subsection 16(9): Additional production of petrochemicals

Quantification of GHGs	Paragraph 16(9)(a) • For the purposes of section 17, quantify GHGs arising from the production of petrochemicals using quantification methods applicable to natural gas processing (Part 4 of Schedule 3 and paragraph 17(2) (b), as applicable).

Quantification of Production	Paragraph 16(9)(b)
	• The facility is deemed not to be engaged in the production of petrochemicals for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of petrochemicals is not to be quantified or reported; and
	  ○ The OBS for the production of petrochemicals (item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.1.4. Natural Gas Transmission (item 5 of Schedule 1)

9.1.4.1. Quantification of production

Division 2 of Part 5 of Schedule 3 outlines how to quantify the production of pipeline-transmission-quality natural gas.

9.2. Mineral Processing

This section outlines quantification provisions in section 12 and Division 2 of Schedule 3 and transitional provisions that apply specifically to facilities engaged in the production of cement and clinker, lime manufacturing, glass manufacturing and gypsum product manufacturing (items 7, 8, 9 and 10 of Schedule 1).

9.2.1. Cement and Clinker Manufacturing (item 7 of Schedule 1)

9.2.1.1. Quantification of production – Transported clinker and cement

As set out in section 1, Division 2 of Part 7 of Schedule 3, production of clinker must be quantified as the quantity of clinker produced that was transported out of the facility within that compliance period.

As set out in section 2, Division 2 of Part 7 of Schedule 3, the quantity of white and grey cement produced refers to cement produced from clinker, which was also produced at same facility. For greater certainty, in order for the white or grey cement produced from clinker to be included in the production and subsequently used for calculating the emissions limit, the clinker must have been produced on site at the facility and never transported outside of the facility.

Example 12: Quantification of production

My cement facility produces clinker and sells part of it, how do I quantify my production?

For a facility that produces clinker and transports some or all of that production off-site, only the clinker that was transported or sold is to be quantified as the production of clinker, as per section 31. For greater clarity, clinker that is produced on-site and remains on-site is not included in the quantity of clinker reported in the annual report. The cement produced from the remaining clinker is considered cement production, either grey cement or white cement, depending on the definition met by the type of cement.

I add additives to my clinker produced on-site to make cement, how do I quantify my cement production?

First, refer to the definitions section of the Regulations for the type of cement produced at your facility (i.e. white or grey cement). For example, *grey cement means a mix composed primarily of clinker that contains more than 0.5% by weight of ferric oxide, gypsum limestone*. This means that if grey cement was produced at your facility and met the definition above, the sum of the clinker, gypsum, limestone, slag or any other additives would be included in the quantity of grey cement produced.

9.2.1.2. Additional reporting – Cement

As set out in section 11 of Schedule 2 (annual report), each of the quantities of clinker, gypsum and limestone that is mixed to produce white or grey cement must be reported separately.

9.2.1.3. Calculated OBS

For a facility that produces white cement (paragraph 7(c) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.2.1.4. Transitional provision – Clinker

As set out in section 82, for the 2019 calendar year only , the production of clinker from a facility that produces clinker may be quantified in accordance with paragraph 36(c) of the Information Order, as it read before August 1, 2019. Therefore, production of clinker may be quantified as tonnes of clinker produced instead tonnes of clinker that is transported out of the facility. However, that production value cannot be used in the calculation of the facility's emissions limit (sections 36, 36.2).

If the quantify of clinker produced was quantified in accordance with section 1, Division 2 of Part 7 of Schedule 3 then that production value can be included in the calculation of the emissions limit. For the 2020 compliance period and beyond, production of clinker must be quantified in tonnes of clinker that is transported out of the facility.

9.2.2. Lime Manufacturing (item 8 of Schedule 1)

9.2.2.1. Quantification of production – Dolomitic lime and specialty lime

To avoid double counting, production of dolomitic lime is to be quantified as the quantity of dolomitic lime that **was not used** in the production of specialty lime (Division 2 of Part 8 of Schedule 3).

Example 13: Quantification of production

A lime facility produces 40,000 tonnes of dolomitic lime and uses 10,000 tonnes of that dolomitic lime to produce 10,000 tonnes of specialty lime. Production would then be reported as 30,000 tonnes for dolomitic lime and 10,000 tonnes for specialty lime.

9.2.2.2. Calculated OBS

For a facility that produces dolomitic lime and specialty lime (paragraphs 8(b) and (c) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for those activities.

9.2.3. Glass Manufacturing (item 9 of Schedule 1)

9.2.3.1. Calculated OBS

For a facility that produces glass, other than glass containers (paragraph 9(b) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.2.3.2. Transitional provision - Glass containers

As set out in section 83, for the 2019 calendar year only, the production of glass from a facility that produces glass containers may be quantified in accordance with section 103.2 of the Information Order, as it read before August 1, 2019. Therefore, production may be quantified as tonnes of glass instead of tonnes of packed glass. However, for the 2020 compliance period and beyond, production must be quantified in tonnes of packed glass.

9.2.4. Gypsum Product Manufacturing (item 10 of Schedule 1)

9.2.4.1. Additional reporting– Gypsum products

As set out in subsection 12(2), for gypsum product manufacturing the quantity of each gypsum product that contains at least 70%wt of calcium sulphate dihydrate produced must be reported, in addition to the sum of these gypsum products. However, when calculating the emissions limit, production for that activity is the sum of all gypsum products produced.

9.2.4.2. Calculated OBS

For a facility that produces gypsum products that contain at least 70%wt of calcium sulphate dihydrate (item 10 of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.3. Chemicals

This section outlines quantification provisions set out in sections 12,16 and 36 in the transitional provisions and in Division 1 of Schedule 3 that apply specifically to facilities engaged in ethanol production, furnace black production, 2–methylpentamethylenediamine (MPMD) production and petrochemicals production (items 13, 14, 15 and 17 of Schedule 1).

9.3.1. Ethanol Production (item 13 of Schedule 1)

9.3.1.1. Emissions limit

As set out in subsection 36(2), a facility that is engaged in the secondary production of ethanol to be used in industrial applications (paragraph 13(b) of Schedule 1) must determine its emissions limit based on the following rules:

a) The OBS for the production of ethanol to be used in industrial applications (paragraph 13(b) of Schedule 1) can only be included in the emissions limit if the facility is also

engaged in the production of ethanol to be used as fuel (paragraph 13(a) of Schedule 1); and

b) If the OBS for the production of ethanol to be used in industrial applications (paragraph 13(b) of Schedule 1) is included in the emissions limit, then the facility is deemed not to be engaged in production of ethanol from distillation for use in the production of alcoholic beverages (item 32 of Schedule 1). This means that the OBS for production of ethanol from distillation for use in the production of alcoholic beverages cannot be used in the calculation of the emissions limit.

9.3.2. Furnace Black Production (item 14 of Schedule 1)

9.3.2.1. Quantification of emissions – WCI Method

As per paragraph 17(2)(b), the quantities of GHGs must be quantified in accordance with the requirements of the method set out in column 3 of the table in Schedule 3. For furnace black production, industrial process, venting and leakage emissions must be quantified in accordance with the prescribed method WCI Method WCI.303. If the prescribed method WCI Method WCI.303(b) was chosen to quantify the GHGs from industrial process emissions, then it is not required to quantify GHGs from venting and leakage emissions using the prescribed methods WCI Method WCI.303(a)(3) and WCI.303(a)(4).

Only one of the methods in WCI Method 303, either WCI.303 (a), WCI.303 (b), or WCI.303(c), should be used to quantify GHGs from industrial process, venting and leaking emissions for the production of furnace black.

9.3.3. 2-methylpentamenthylenediamine (MPMD) Production (item 15 of Schedule 1)

9.3.3.1. Additional production

Subsection 16(3): Additional production of hydrogen gas

Quantification of GHGs	Paragraph 16(3)(a) • For the purposes of section 17, quantify GHGs arising from the production of hydrogen gas using quantification methods applicable to the production of MPMD (Part 15 of Schedule 3 and paragraph 17(2)(b), as applicable).
Quantification of Production	Paragraph 16(3)(b) • Production of hydrogen gas has to be quantified and reported in the annual report as per subsection 12(3). • The facility is deemed not to be engaged in the production of hydrogen gas and petrochemicals for the purposes of calculating the emissions limit. ○ The OBSs for the production of hydrogen gas (item 6 of Schedule 1) and production of petrochemicals

	(item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.3.4. Petrochemicals Production (item 17 of Schedule 1)

9.3.4.1. Additional reporting – Hydrogen gas

As set out in section 12 of Schedule 2 (annual report), for the production of petrochemicals, in addition to the quantity of hydrogen gas produced, the quantity of hydrogen gas sold and its concentration in weight percentage must be reported. For greater certainty, when calculating the emissions limit, only the quantity of hydrogen gas produced is included as part of the production.

9.3.4.2. Additional production

Subsection 16(2): Additional production of natural gas liquids

Quantification of GHGs	Paragraph 16(2)(a) • For the purposes of section 17, quantify GHGs arising from the production of natural gas liquids using quantification methods applicable to petrochemicals production (Part 17 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(2)(b)
	• The facility is deemed not to be engaged in the production of natural gas liquids for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of natural gas liquids is not required to be quantified or reported; and
	  ○ The OBS for the production of natural gas liquids (paragraph 4(b) of Schedule 1) cannot be used in the calculation of the emissions limit.

9.3.4.3. Transitional provisions – High value chemicals

As set out in section 84, for the 2019 calendar year only, the production of high-value chemicals may be quantified in accordance with section 103.36 of the Information Order, as it read before August 1, 2019. In this case, the production is quantified as tonnes of high-value chemicals, the production value is limited to the sum of hydrogen gas, ethylene, propylene, butadiene and pyrolysis gas that are produced from steam cracking. That production value can be used in the calculation of the emissions limit.

If the quantity of high-value chemicals produced is quantified in accordance with the Regulations, then that production value includes all the high-value chemicals produced from steam cracking

and is not limited to hydrogen gas, ethylene, propylene, butadiene and benzene produced from pyrolysis gas.

For the 2020 calendar year and beyond, production must be quantified as per section 31, in tonnes of high-value chemicals from steam cracking, including but not limited to hydrogen gas, ethylene, propylene, butadiene and benzene produced from pyrolysis gas (paragraph 17(a) of Schedule 1).

9.3.5. Vaccine Production (item 18 of Schedule 1)

9.3.5.1. Quantification of Production

As set out in Division 2 of Part 18 of Schedule 3, the production of vaccine from a facility must be quantified at the end of the formulation step of the manufacturing process using the formula below:

$$\sum_{i=1}^{n} (A \times B)_i$$

Where:
A is the capacity of each tank "i" that is used to combine ingredients at that step, expressed in litres;
B is the number of batches produced in tank "i"; and
i is the i^{th} tank where "i" goes from 1 to n where n is the total number of tanks used to combine ingredients.

Example 14: Quantification of production

A facility uses 3 tanks to combine ingredients at the end of the formulation step of the manufacturing process. Each tank has a capacity of 200L, 300L and 200L, respectively. The number of batches produced in each tank in one year is 120, 100 and 80, respectively.

$$(A_1 \times B_1) + (A_2 \times B_2) + (A_3 \times B_3)$$

- The values A_1, A_2 and A_3 correspond to 200L, 300L and 200L, respectively, which are the capacities of each tank used to combine ingredients at the end of the formulation step of the manufacturing process.
- The values B_1, B_2 and B_3 correspond to 120, 100 and 80, respectively, which are the number of batches produced in each tank.

$$(200 \times 120) + (300 \times 100) + (200 \times 80) = 70{,}000\ L$$

The facility's total annual vaccine production is 70,000L of vaccine.

9.3.5.2. *Calculated OBS*

For a facility that produces vaccines for human or animal use (item 18 of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for this activity.

9.4. Iron, Steel and Metal Tubes

This section outlines quantification rules set out in section 16 that apply specifically to facilities engaged in scrap-based steel production and integrated steel production (items 19 and 20 of Schedule 1).

9.4.1. Scrap Based Steelmaking (item 19 of Schedule 1)

9.4.1.1. *Additional production*

Subsection 16(4): Additional production of metal tubes

Quantification of GHGs	Paragraph 16(4)(a) • For the purposes of section 17, quantify GHGs arising from the production of metal tubes using quantification methods applicable to scrap based steelmaking (Part 19 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(4)(b)
	• The facility is deemed not to be engaged in the production of metal tubes for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of metal tubes is not required to be quantified or reported.
	  ○ The OBS for the production of metal tubes (item 22 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.4.2. Integrated Steel Production (item 20 of Schedule 1)

9.4.2.1. *Additional production*

Subsection 16(4): Additional production of metal tubes

Quantification of GHGs	Paragraph 16(4)(a) • For the purposes of section 17, quantify GHGs arising from the production of metal tubes using quantification methods

	applicable to integrated steel production (Part 20 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(4)(b)
	• The facility is deemed not to be engaged in the production of metal tubes for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of metal tubes is not required to be quantified or reported; and
	  ○ OBS for the production of metal tubes (item 22 of Schedule 1) cannot be used in the calculation of the emissions limit.

Subsection 16(5): Additional production of lime

Quantification of GHGs	Paragraph 16(5)(a) • For the purposes of section 17, quantify GHGs arising from the production of lime using quantification methods applicable to integrated steel production (Part 20 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(5)(b)
	• The facility is deemed not to be engaged in the production of lime for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of lime is not required to be quantified or reported; and
	  ○ The OBS for the production of lime (item 8 of Schedule 1) cannot be used in the calculation of the emissions limit.

Subsection 16(6): Additional production of electricity

Quantification of GHGs	Paragraph 16(6)(a) • For the purposes of section 17, quantify GHGs arising from the production of electricity using quantification methods applicable to integrated steel production (Part 20 of Schedule 3 and paragraph 17(2)(b), as applicable).
Quantification of Production	Paragraph 16(6)(b)

- The facility is deemed not to be engaged in the generation of electricity using fossil fuels for the purposes of quantifying production and calculating the emissions limit.
    - The generation of electricity is not required to be quantified or reported; and
    - The OBS for the generation of electricity (item 38 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.4.2.2. Calculated OBS

For a facility that produces steel in an electric arc furnace (paragraph 20(d) of Schedule 1), an OBS must be calculated as per sections 37 and 38 and refer to the example below.

Example 15: Calculated OBS for an integrated steel production facility

An integrated steel production facility produces steel in a basic oxygen furnace (BOF) and an electric arc furnace (EAF). In addition, the facility produces metallurgical coke and iron and generates electricity from fossil fuels. There is a numerical OBS for the production of coke, iron and steel in BOF but an OBS for production of steel in EAF must be calculated.

The table below provides the quantity of GHGs and production associated with each activity that the facility is engaged in for the 2017 and 2018 reference years. The quantity of GHGs from the generation of electricity must be quantified as per paragraph 16(6)(a). However, the quantity of GHGs from the generation of electricity that are attributed to the production of steel in EAF needs to be determined.

	Quantity of GHGs in 2017 (tonnes of CO_2e)	***Quantity of GHGs in 2018 (tonnes of CO_2e)***	***Production in 2017 (tonnes)***	***Production in 2018 (tonnes)***
Coke making (C_{coke})	270,000	285,000	535,000	565,000
Iron making (C_{iron})	2,800,000	2,950,000	2,100,000	2,175,000
Steel in BOF (C_{BOF})	355,000	360,000	2,200,000	2,320,000
Steel in EAF (C_{EAF})	80,000	85,000	1,125,000	1,180,000
Electricity generation (C_{EE})	6,000	7,000	335,000 MWh	355,000 MWh

Facility's total quantity of GHGs (C_{FT})	3,511,000	3,687,000
	2017 Reference year	2018 Reference year
Quantity of GHGs from electricity generation attributable to the production of steel in an EAF (CEE_{EAF})	Calculated	Calculated

The quantity of GHGs from the generation of electricity attributable to the production of steel in an EAF can be calculated several ways but in this example it is based on the ratio of quantity of GHGs from EAF (C_{EAF}) over the sum of the quantity of GHGs from all four activities, multiplied by the quantity of GHGs from electricity generation (C_{EE}).

The formula below calculates the quantity of GHGs from electricity generation attributable to the production of steel in an EAF:

$$CEE_{EAF\ 2017} = \left[\frac{\mathrm{C}_{\mathrm{EAF\ 2017}}}{C_{\mathrm{Coke\ 2017}} + \mathrm{C}_{\mathrm{iron\ 2017}} + C_{\mathrm{BOF\ 2017}} + C_{\mathrm{EAF\ 2017}}}\right] \times \mathrm{C}_{EE\ 2017}$$

$$CEE_{EAF\ 2018} = \left[\frac{\mathrm{C}_{\mathrm{EAF\ 2018}}}{C_{\mathrm{Coke\ 2018}} + \mathrm{C}_{\mathrm{iron\ 2018}} + C_{\mathrm{BOF\ 2018}} + C_{\mathrm{EAF\ 2018}}}\right] \times \mathrm{C}_{EE\ 2018}$$

$$CEE_{EAF\ 2017} = \left[\frac{80{,}000}{270{,}000 + 2{,}800{,}000 + 355{,}000 + 80{,}000}\right] \times [6{,}000] = 137\ tonnes\ of\ CO2e$$

$$CEE_{EAF\ 2018} = \left[\frac{85{,}000}{285{,}000 + 2{,}950\,000 + 360{,}000 + 85{,}000}\right] \times [7{,}000] = 162\ tonnes\ of\ CO2e$$

The formula below calculates the OBS for the production of steel in EAF:

$$\frac{\sum_{\mathrm{i=1}}^{\mathrm{n}}(\mathrm{A} - \mathrm{B} - \mathrm{C})_{\mathrm{i}}}{\sum_{\mathrm{i=1}}^{\mathrm{n}} \mathrm{D}_{\mathrm{i}}} \times \mathrm{E} = \left[\frac{(\mathrm{A} - \mathrm{B} - \mathrm{C})_{2017} + (\mathrm{A} - \mathrm{B} - \mathrm{C})_{2018}}{\mathrm{D}_{2017} + \mathrm{D}_{2018}}\right] \times \mathrm{E}$$

- The values A correspond 3,511,000 and 3,687,000 tonnes of CO_2e for 2017 and 2018, respectively, are the facility's total quantity of GHGs.
- The value B corresponds to zero because the facility did not purchase or sell any thermal energy.

- The values C will include the total quantity of GHGs associated with coke making, iron making, BOF steelmaking and any quantity of GHGs from electricity generation attributable to all activities other than the EAF steelmaking, which in this case is the difference between the total of the facility quantity of GHGs from electricity generation, and the quantity of GHGs attributed to EAF.

  The value C is determined by the following formula:

$$C = C_{coke} + C_{iron} + C_{BOF} + (C_{EE} - CEE_{EAF})$$

$$C_{2017} = 270{,}000 + 2{,}800{,}000 + 335{,}000 + (6{,}000 - 137) = 3{,}430{,}863\ tonnes\ of\ CO_2e$$
$$C_{2018} = 285{,}000 + 2{,}950{,}000 + 360{,}000 + (7{,}000 - 162) = 3{,}601{,}838\ tonnes\ of\ CO_2e$$

- The value D corresponds to 1,125,000 and 1,180,000 tonnes of steel in EAF in 2017 and 2018, respectively, are the total production of steel in EAF.
- The value E corresponds to 95%, which is the specified GHG emissions reduction factor for an integrated steel production facility. Subsection 37(1) sets out the values for E by industrial activity.

$$\left[\frac{(\mathrm{A} - \mathrm{B} - \mathrm{C})_{2017} + (\mathrm{A} - \mathrm{B} - \mathrm{C})_{2018}}{\mathrm{D}_{2017} + \mathrm{D}_{2018}}\right] \times \mathrm{E}$$

$$\left[\frac{(3{,}511{,}000 - 0 - 3{,}430{,}863\ ) + (3{,}687{,}000 - 0 - 3{,}601{,}838\ )}{(1{,}125{,}000 + 1{,}180{,}000)}\right] \times 0.95$$

$$= 0.06813 \frac{\text{tonnes of } \mathrm{CO_2e}}{\text{tonnes of steel}}$$

The OBS for the production of steel in the EAF is 0.0681 tonnes of CO_2e/tonnes of steel, which is also rounded to three significant figures as per subsection 37(4).

9.5. Mining and Ore Processing

This section outlines quantification provisions as set out in sections 11, 16 and Schedule 3 that apply specifically to facilities engaged in base metal production, coal mining and production of metals or diamonds (paragraphs 23(b) and (c), 25, 26(d) and 26(f) of Schedule 1 of Regulations).

9.5.1. Base Metal Production (item 23 of Schedule 1)

9.5.1.1. Additional production - Pyrometallurgical smelting and refining of lead

Subsection 16(7): Pyrometallurgical smelting of zinc and lead

Quantification of GHGs	Paragraph 16(7)(a) • For the purposes of section 17, quantify GHGs arising from the pyrometallurgical smelting of zinc and lead using quantification methods applicable to pyrometallurgical smelting and refining of lead (Part 23 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(7)(b)
	• The facility is deemed not to be engaged in the pyrometallurgical smelting of zinc and lead for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production resulting from the pyrometallurgical smelting of zinc and lead is not required to be quantified or reported; and
	  ○ The OBS for the pyrometallurgical smelting of zinc and lead (paragraph 23(c) of Schedule 1) cannot be used in the calculation of the emissions limit.

9.5.1.2. Calculated OBS

For a facility that is engaged in the pyrometallurgical smelting of copper and hydrometallurgical electrorefining of copper anodes (paragraph 23(a) and (f) of Schedule 1), OBSs must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for those activities.

9.5.2. Coal Mining (item 25 of Schedule 1)

9.5.2.1. Annual Report

As set out in subsection 11(c), a facility that produces coal by mining coal deposits and generates electricity from a unit or a group of units registered under the Coal-fired Electricity Regulations must include in the annual report the following:

a. The total quantity of GHGs from the facility, which is the sum of the total quantity of GHGs from mining coal deposits that were quantified in accordance with section 17 and the total quantity GHGs from the generation of electricity that were quantified in accordance with section 20.

b. The production of thermal coal and metallurgical coal quantified in tonnes, as applicable, which was quantified in accordance with section 31.

c. The generation of electricity quantified for each fossil fuel type for each unit within the facility as per section 32, including the sum of electricity generated from all units.

In addition, the annual report must include the remaining information listed in sections 11, 12 and Schedule 2.

9.5.2.2. Methane leakage emissions from surface coal mining

As set out in section 1 of Part 25 of Schedule 3, methane leakage emissions from surface coal mining must be quantified based on the formula below:

$$\text{Quantity of coal extracted [tonnes]} \times \text{Emission factor } [\frac{\text{tonnes of } CH_4}{\text{tonnes of coal}}]$$

Where:
Coal extracted is the quantity of coal extracted at the facility (in tonnes).
Emission factor is the emission factor indicated in column 3 of Table 2 of Part 25 of Schedule 3 for the coal type as set out in column 2 of that Table, for the province of extraction set out in column 1 of the same Table.

9.5.2.3. Calculated OBS

For a facility that produces thermal coal (paragraph 25(a) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.5.2.4. Emissions Limit

As set out in section 42, a facility that is engaged in the production of coal by mining coal deposits and also the generation of electricity from a unit or a group of units registered under the Coal-fired Electricity Regulations must calculate its emissions limit in CO_2e tonnes, which is the sum of:

a) The emissions limit calculated under subsection 36(1) for the industrial activity of production of coal by mining coal deposits (item 25 of Schedule 1); and
b) The emissions limit calculated under section 41 or 41.2 for the industrial activity of generation of electricity (item 38 of Schedule 1).

9.5.3. Production of Metals or Diamonds (item 26 of Schedule 1)

9.5.3.1. Additional reporting

As set out in subsection 13(a) of Schedule 2, for the production of silver, platinum and palladium (paragraph 26(c) of Schedule 1), the quantity of each of those metals produced must be reported separately, in addition to the sum of these metals. However, in accordance with sections 36 and 36.2, when calculating the emissions limit, production is the sum of all metals produced.

As set out in subsection 13(b) of Schedule 2, for the production of base metal ore concentrate (paragraph 26(d) of Schedule 1), the quantity of each of those base metals produced must be reported separately, in addition to the sum of these base metals. However, in accordance with sections 36 and 36.2, when calculating the emissions limit, production is the sum of all base metals produced.

9.5.3.2. Additional production – Production of base metal ore concentrate

Subsection 16(8): Additional production of gold, silver, platinum or palladium

Quantification of GHGs	Paragraph 16(8)(a) • For the purposes of section 17, quantify GHGs arising from the production of gold, silver, platinum or palladium using quantification methods applicable to production of base metal ore concentrate (Part 26 of Schedule 3 and paragraph 17(2)(b), as applicable).

Quantification of Production	Paragraph 16(8)(b)
	• The facility is deemed not to be engaged in the production of gold, silver, platinum or palladium for the purposes of quantifying production and calculating the emissions limit.
	  ○ The production of gold, silver, platinum or palladium is not required to be quantified and reported; and
	  ○ The OBSs for the production of gold, silver, platinum and palladium (paragraph 26(c) and (f) of Schedule 1) cannot be used in the calculation of the emissions limit.

9.5.3.3. Additional production – Production of gold

Subsection 16(10): Additional production of silver, platinum or palladium

Quantification of GHGs	Paragraph 16(10)(a) • For the purposes of section 17, quantify GHGs arising from the production of silver, platinum or palladium using quantification methods applicable to production of gold (Part 26 of Schedule 3 and paragraph 17(2) (b), as applicable).

Quantification of Production	Paragraph 16(10)(b)
	• The facility is deemed not to be engaged in the production of silver, platinum or palladium for the purposes of quantification production and calculating the emissions limit.
	  ○ The production of silver, platinum or palladium is not required to be quantified or reported; and
	  ○ The OBS for the production of silver, platinum or palladium (paragraph 26(c) of Schedule 1) cannot be used in the calculation of the emissions limit.

9.5.3.4. *Calculated OBS*

For a facility that produces silver, platinum or palladium (paragraph 26(c) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.6. Nitrogen Fertilizers

This section outlines quantification provisions set out in sections 16 and 36 that apply specifically to facilities engaged in the production of nitrogen-based fertilizer (item 29 of Schedule 1).

9.6.1. Nitrogen-based Fertilizer Production (item 29, column 1, of Schedule 1)

9.6.1.1. *Additional production*

Subsection 16(3): Additional production of hydrogen gas

Quantification of GHGs	Paragraph 16(3)(a) • For the purposes of section 17, quantify GHGs arising from the production of hydrogen gas using quantification methods applicable to nitrogen-based fertilizer production (Part 29 of Schedule 3 and paragraph 17(2)(b), as applicable).
Quantification of Production	Paragraph 16(3)(b) • Production of hydrogen gas has to be quantified and reported in the annual report as per subsection 12(3);and • The facility is deemed not to be engaged in the production of hydrogen gas and petrochemicals for the purposes of calculating the emissions limit. ○ The OBSs for the production of hydrogen gas (item 6 of Schedule 1) and production of petrochemicals (item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

9.6.1.2. *Emissions limit – urea and ammonium phosphate*

Paragraphs 29(c) and (d) of Schedule 1 both specify that the production of urea liquor or ammonium phosphate is considered an industrial activity when it is made in addition to producing anhydrous ammonia or aqueous ammonia by the steam reforming of hydrocarbons. This means that the applicable OBSs for production of urea liquor and ammonium phosphate (paragraphs 29(c) or (d) of Schedule 1) can only be used for calculating the emissions limit if the facility is also engaged in the production of anhydrous or aqueous ammonia (paragraph 29(b) of Schedule 1) as shown in the Figure 9 below.

For greater certainty, subsection 36(4) specifies that the OBS applicable to each activity in which the facility is engaged must be used in the calculation of the emissions limit. As an example, a facility engaged in the production of anhydrous or aqueous ammonia and in the production of urea liquor would include in the emissions limit both the OBS specified in paragraph 29(b) for the quantity of anhydrous or aqueous ammonia produced and the OBS specified in paragraph 29(c) for the quantity of urea liquor produced.

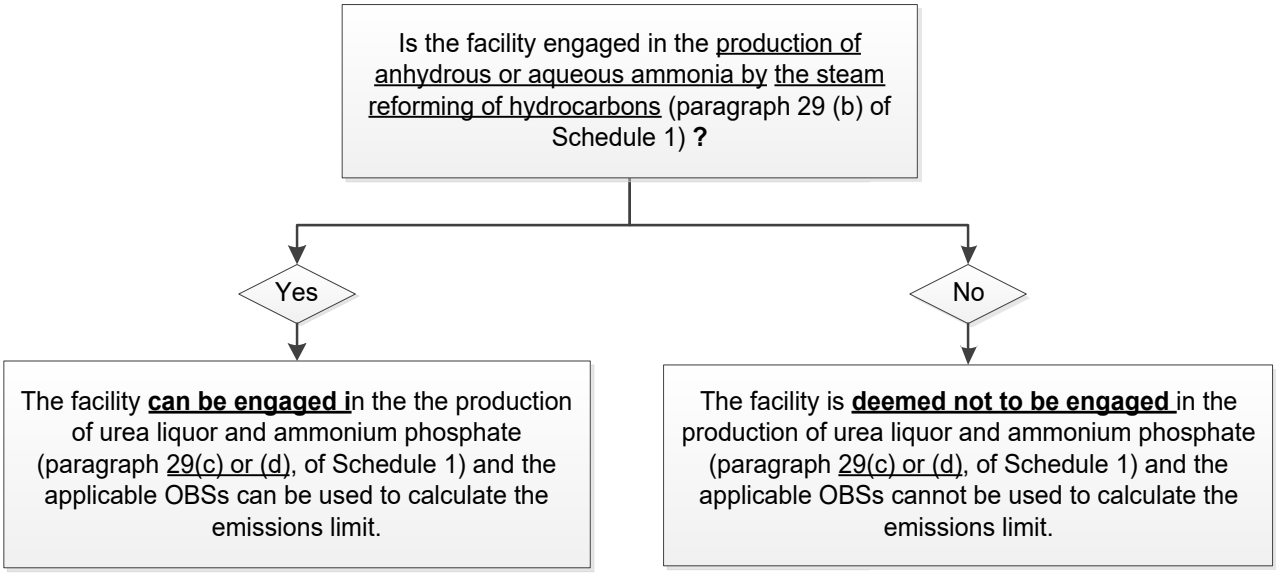


Figure 9: Facility engaged in the production of anhydrous or aqueous ammonia.

9.6.1.3. Calculated OBS

For a facility that produces ammonium phosphate in addition to producing anhydrous or aqueous ammonia by the steam reforming of hydrocarbons (paragraph 29(d) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

9.7. Food Processing

This section outlines quantification provisions set out in section 36 that apply specifically to facilities engaged in the processing of oilseeds (item 31 of Schedule 1).

9.7.1. Oilseed Processing (item 31 of Schedule 1)

9.7.1.1. Emissions Limit

As set out in subsection 36(3), for 2019 calendar year only, industrial processing of oilseed from a facility that produces oilseeds may be quantified as the quantity of finished oilseed products instead of the quantity of oilseed used as raw material.

- In the case where production was quantified as tonnes of finished oilseed products, the applicable OBS is 0.0431 tonnes of CO_2e per tonnes of finished oilseed products for the purposes of calculating the emissions limit.

- However, where production was quantified as tonnes of oilseed used as raw material, the applicable OBS is 0.0481 tonnes of CO_2e per tonnes of oilseed used as raw material for the purposes of calculating the emissions limit, as set out under item 31, column 3, Schedule 1.

For the 2020 calendar year and beyond, production must be quantified as tonnes of oilseed used as raw material and the applicable OBS is identified in item 31 of Schedule 1.

9.8. Pulp and Other products

This section outlines quantification provisions set out in section 85.1 and Schedule 3 that apply specifically to facilities engaged in the production of pulp and other products (item 36 of Schedule 1.

9.8.1. Pulp and Paper Production (item 36 of Schedule 1)

9.8.1.1. Quantification of production

Division 2 of Part 36 of Schedule 3 sets out additional quantification requirements when quantifying production in tonnes of finished products and specialty products. As per subsection 1(2), Division 2 of Part 36 under Schedule 3, a finished product referred to in paragraph 1(1)(b) of the same Division does not include pulping liquor, wood waste, non-condensable gases, sludge, tall oil, turpentine, biogas, steam, water or products that are used in the production process.

As per subsection 1(3), Division 2 of Part 36 under Schedule 3, a specialty product means abrasive paper base, food grade grease resistant paper, packaging waxed paper base, paper for medical applications, napkins paper for commercial use, towel paper for commercial or domestic use, bath paper for domestic use and facial paper for domestic use.

9.8.1.2. Emissions limit

Paragraphs 36(a) and (b) of Schedule 1 both refer to the production of pulp from wood, other plant material or paper or any product derived directly from pulp or a pulping process, excluding specialty products. The difference between these two activities is that in the case of the industrial activity set out in paragraph 36(a), the facility is equipped with a recovery boiler, lime kiln or pulping digester and in the case of the industrial activity set out in paragraph 36(b), the facility is not equipped with that equipment.

This means that only one of the two OBSs (paragraphs 36(a) and (b) of Schedule 1) can be used in the calculation of the emissions limit. Similarly, a tonne of production cannot be double counted as both finished product and specialty product. Figure 10 below provides a summary of the

applicable OBSs depending on the activity the facility is engaged in for the purposes of item 36 of Schedule 1.

9.8.1.3. Calculated OBS

For a facility that produces specialty products (paragraph 36(c) of Schedule 1), an OBS must be calculated as per section 37. Refer to the general examples in sections 7.4.1 and 7.4.2 of this document on how to calculate the OBS for that activity.

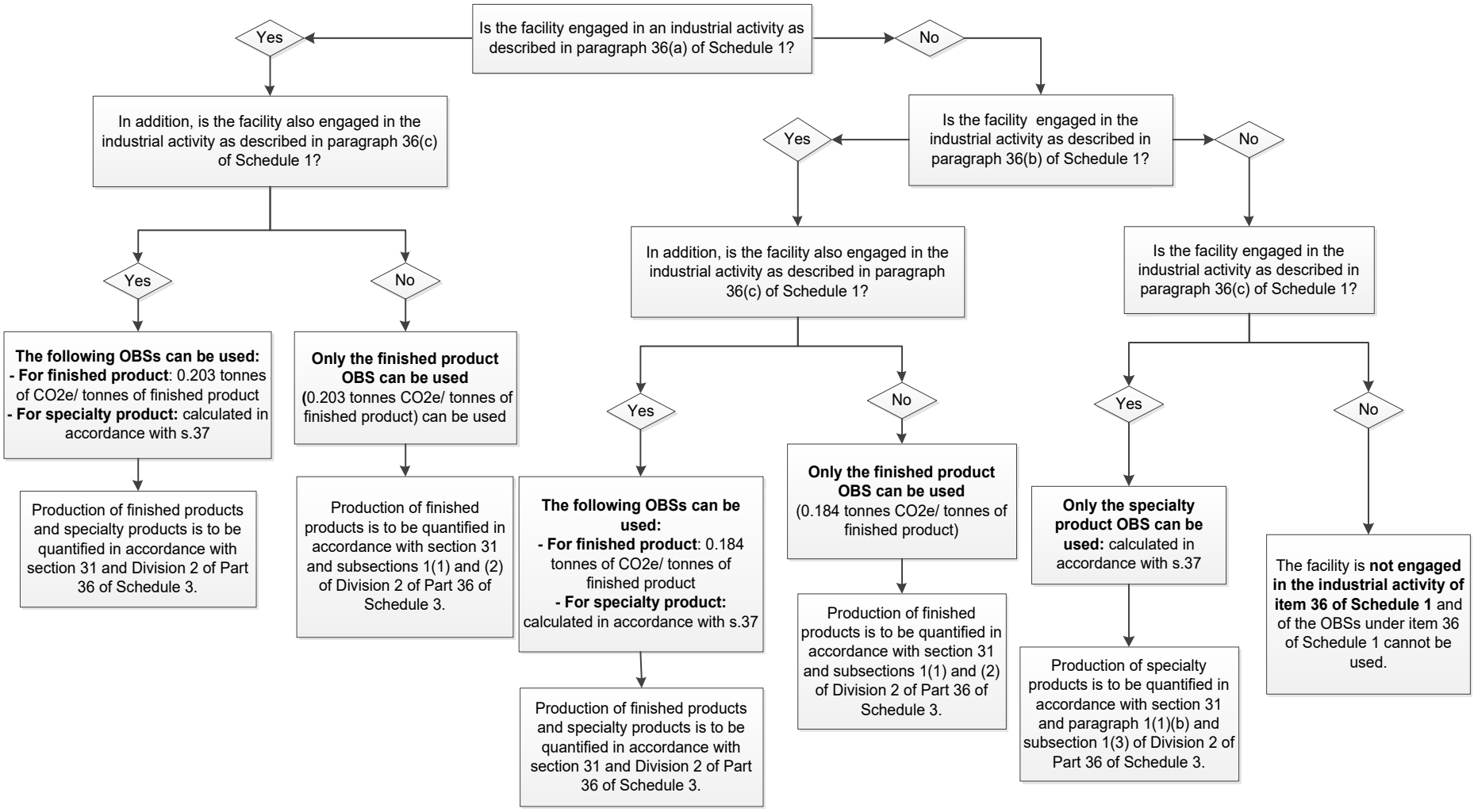


Figure 10: For a facility engaged in an industrial activity listed in item 36 of Schedule 1.

9.8.1.4. Transitional provisions – Specialty products

As set out in subsection 85.1(1), for the 2019 calendar year only, the production of specialty products can be quantified in accordance with section 102 of the Information Order. This means production can be quantified in tonnes of finished products and the following OBSs would apply:

(a) 0.203 CO_2e tonnes per tonne of finished product for a facility equipped with a recovery boiler, lime kiln or pulping digester; or

(b) 0.184 CO_2e tonnes per tonne of finished product for a facility not equipped with a recovery boiler, lime kiln or pulping digester.

As set out in subsection 85.1(2), if the facility is engaged in the production of specialty products but chose to quantify it in tonnes of finished products as per subsection 85.1(1), then the facility must report separately the quantity of specialty products produced (tonnes of specialty products), as part of their annual report, if that information is available.

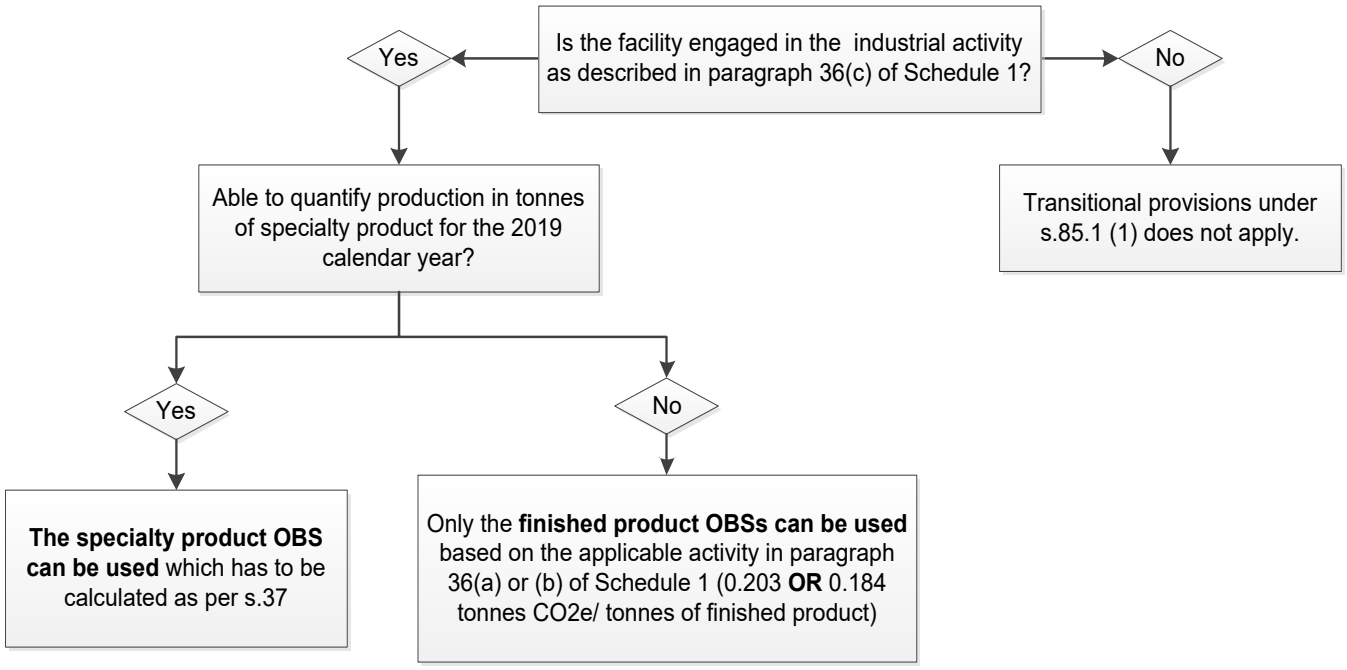


Figure 11: Transitional provisions under subsection 85.1(1) for the 2019 calendar year

9.9. Automotive Production

9.9.1. Automotive production (item 37 of Schedule 1)

9.9.1.1. Quantification of production

As set out in Division 2 of Part 37 of Schedule 3, the number of vehicles must be quantified as the quantity of four-wheeled self-propelled vehicles produced that are designed for use on a highway and that have a gross vehicle weight rating of less than 4,536 kg (10,000 lb) assembled during the compliance period.

9.10. Generation of Electricity (item 38 of Schedule 1)

This section outlines quantification provisions set out in section 32 and Division 2 Part 38 of Schedule 3 that apply specifically to facilities engaged in the generation of electricity (item 38 of Schedule 1).

9.10.1. Electricity Generation at an electricity generation facility

As set out in Section 32, an electricity generation facility must quantify its gross electricity generated from fossil fuels, in GWh, for each unit. The table below illustrates the quantification requirements to determine the gross electricity generated.

Table 3: Quantification of gross electricity production

Fuel Type Combusted in the unit	Quantification of electricity production
• **Single fossil fuel**	Subsection 4(1) of Part 38, Schedule 3
• **mixture of fossil fuels or a mixture of biomass and fossil fuels**	Subsections 4(2) and (3) of Part 38, Schedule 3
Hybrid configuration unit (regardless of the fuel type)	Section 5 of Part 38, Schedule 3

As per subsection 32(2), an electricity generation facility may choose to quantify in whole or in part the electricity generated from one unit or a group of unit. A facility may also choose to not quantify any electricity generated from one unit or a group of unit. GHGs resulting from the generation of any electricity are always quantified even if the gross quantity of electricity produced is not quantified.

9.10.1.1. Generation of Electricity Using a Mixture of Fossil Fuels or a Mixture of Biomass and Fossil Fuels

As set out in subsection 4(2), Part 38 of Schedule 3, electricity generated from an electricity generation facility that uses a mixture of fossil fuels or a mixture of biomass and fossil fuels must be quantified in accordance with following formula:

$$_{u} \times \frac{HFF_k}{H_B + \sum HFF_k}$$

Where

G_U is the gross quantity of electricity generated by the unit during a compliance period, as measured at the electrical terminals of the generators of the unit using meters that comply with the requirements of the *Electricity and Gas Inspection Act* and the *Electricity and Gas Inspection Regulations*, expressed in GWh;

HFF_k is determined in accordance with the following formula, calculated separately for gaseous fuels, liquid fuels and solid fuels type “k”:

$$H_{FF_k} = \sum_{j=1}^{n} QFF_{k,j} \times HHV_{k,j}$$

where
QFF_j is the quantity of gaseous, liquid or solid fuel, as the case may be, type "j" combusted in the unit to generate electricity during the compliance period, determined in accordance with subsection 4(3) in Division 2 of Part 38 of Schedule 3,
HHV_j is the higher heating value of the gaseous, liquid or solid fuel, as the case may be, type "j" combusted in the unit, determined in accordance with subsection 24(1) of the Coal-fired Electricity Regulations, and
j is the j^{th} fossil fuel type combusted in the unit, where "j" goes from 1 to m and where m is the number of types of gaseous, liquid or solid fuel combusted, as the case may be, combusted; and

H_B is determined in accordance with the formula:

$$H_B = \sum_{i=1}^{n} QB_i \times HHV_i$$

where:
QB_i is the quantity of biomass fuel type "i" combusted in the unit to generate electricity during the compliance period, determined in accordance with the subsection 4(3) in Division 2 of Part 38 of Schedule 3,
HHV_i is the higher heating value for the biomass fuel type "i" combusted in the unit, is determined in accordance with subsection 24(1) of Coal-fired Electricity Regulations, and
i is the i^{th} biomass fuel type combusted in the unit, where "i" goes from 1 to n and where n is the number of types of biomass fuels combusted.

Refer the example below on how the calculate the gross electricity generation from the combustion of fossil fuels and biomass.

Example 16: Gross electricity generation from the combustion of fossil fuels and biomass

An electricity generation facility produces electricity using fossil fuels. The unit uses bituminous coal and natural gas to generate electricity. The gross amount of electricity generated must be calculated for each fossil fuel type (solid and gaseous fuel type) used in the unit.

Fuels burn in unit	Quantity of fuel combusted	HHV
Bituminous coal (solid)	20,000 tonnes	30.5 GJ/tonnes
Natural gas (gaseous)	70,000 standard m^3	0.03793 GJ/standard m^3

1. First, the gross electricity generated by each fossil fuel (coal and natural gas) in the unit needs to be determined using the equation below:

$$_u \times \frac{HFF_k}{H_B + \sum HFF_k}$$

- The value of Gu corresponds to 6662 GWh which is the gross quantity of electricity generated by the unit.
- The value of HFF_k is determined for bituminous coal and natural gas using the formula below.
- The value of H_B corresponds to zero because the facility does not burn biomass fuel to produce electricity.

2. HFF_k needs to be calculated for the gaseous and solid fuel.

- k=solid: there is one type solid fuel combusted (i.e.: coal), as a result n=1.
- k=gaseous: there is one type gaseous fuel combusted (i.e.: natural gas), as a result n=1.

$$\mathrm{HFF_{solid}} = \sum_{j=1}^{n} \mathrm{QFF_{k,j}} \times \mathrm{HHV_{k,j}} = (\mathrm{QFF_{solid,1}} \times \mathrm{HHV_{solid,1}})$$

$$\mathrm{HFF_{gaseous}} = \sum_{j=1}^{n} \mathrm{QFF_{k,j}} \times \mathrm{HHV_{k,j}} = \mathrm{QFF_{gaseous,1}} \times \mathrm{HHV_{gaseous,1}}$$

- The value of $QFF_{solid,1}$ corresponds to 20,000 tonnes, which is the quantity of bituminous coal combusted.
- The value of $HHV_{solid,1}$ corresponds to 30.5 GJ/tonnes, which is the higher heating value for bituminous coal fuel as determined in accordance with subsection 24(1) of the Coal-fired Electricity Regulations.
- The value of $QFF_{gaseous,1}$ corresponds to 70,000 standard m^3, which is the quantity of natural gas fuel combusted.
- The value of $HHV_{gaseous,1}$ corresponds to 0.03793 GJ/standard m^3, which is the higher heating value for natural gas determined under section 24(1) of the Coal-fired Electricity Regulations.

3. The value of HFF_{solid} and $HFF_{gaseous}$ are:

$$\mathrm{HFF_{solid}} = 20{,}000\ tonnes \times 30.5 \frac{GJ}{tonnes} = 610{,}000\ GJ$$

$$\mathrm{HFF_{gaseous}} = 70{,}000\ \text{standard}\ \mathrm{m^3} \times 0.03793 \frac{\mathrm{J}}{\text{standard}\ \mathrm{m^3}} = 2{,}655\ GJ$$

4. The gross electricity generated from the combustion of bituminous coal and natural gas fuels in the unit are calculated below. The final production values have to be rounded to three significant figures as per section 33.

$$For\ solid\ fuel: \quad {}_{u} \times \frac{HFF_{solid}}{H_B + \sum HFF} = 6661.58\ Wh \quad \times \frac{610{,}000\ J}{0 + (2{,}655\ J \ + \ 610{,}000\ J\ )}$$
$$= 6633.13\ Wh \quad \approx 6630\ Wh$$

$$For\ gaseous\ fuel: \quad {}_{u} \times \frac{HFF_{gaseous}}{H_B + \sum HFF} = 6661.58\ Wh \quad \times \frac{2{,}655{,}100\ J}{(21{,}326{,}600\ J \ + \ 2{,}655{,}100\ J\ )}$$
$$= 28.87\ Wh \quad \approx 28.9\ Wh$$

The gross electricity generated from the unit from solid fuel is 6630 GWh and gaseous fuel is 28.9 GWh.

9.10.1.2. Emissions Limit – Increased Capacity of Electricity Generation

Refer to Example 8 that illustrates how the emissions limit is calculated for an electricity generation facility that met the requirements in section 41.2 where the capacity of electricity generation from gaseous fuel has increased by 50 MW or more after January 1, 2021 and the unit was designed to operate at a thermal energy to electricity ratio of less than 0.9.

9.10.2. Electricity Generation at Industrial Facilities

As set out under subparagraph 31(1)(b)(i), an industrial facility that generates electricity from fossil fuels must quantify its total electricity production in accordance with:

- section 6 of Part 38 of Schedule 3 if the industrial facility generates electricity from a single fossil fuel; or
- section 7 of Part 38 of Schedule 3 if the industrial facility generates electricity from a mixture of fossil fuels or a mixture of biomass and fossil fuels.

However, the facility may choose to quantify that electricity generation in whole or in part or not to quantify any electricity generated as per subparagraph 31(1)(b)(ii). Note that GHGs resulting from the generation of any quantity of electricity must always be quantified even if the gross quantity of electricity produced is not quantified.

Refer to the example below on how to calculate the gross electricity generation from using fossil fuels and biomass at the industrial facility.

Example 17: Gross electricity generation from both fossil fuels and biomass

The generation of electricity from a mixture of fossil fuels and biomass must be calculated for each type of fuel. The same calculation steps are to be followed as in Example 16 of section 9.10.1.1 of this document. However, the formula variables have different references and are

listed below. The equations in section 7 of Part 38 of Schedule 3 are similar to the equations in subsections 4(2) and (3) of that same Part:

- the quantity of gaseous, liquid or solid fuel (QFF_j) is determined as per subsection 7(2) of Schedule 3 Part 38 and section 2.C.2 of the GHGRP.
- the higher heating value of the gaseous, liquid or solid fuel (HHV_j) is determined as per sections 2.C.1 and 2.C.3 of the GHGRP.
- the quantity of biomass fuel type (QB_i) is determined as per subsection 7(2) of Schedule 3 Part 38, sections 2.C.2 of the GHGRP and the WCI Method WCI.214.
- the higher heating value of each biomass fuel type (HHV_i) is determined as per sections 2.C.1 and 2.C.3 of the GHGRP and the WCI Method WCI.214.

9.10.2.1. Emissions Limit – Increased Capacity of Electricity Generation

Refer to Example 7 for an example that illustrates how the emissions limit is calculated for an industrial facility that met the requirements of section 36.2 where the capacity of electricity generation from gaseous fuel has increased by 50 MW or more, on or after January 1, 2021 and that increased capacity is from equipment that has a thermal energy to electricity ratio of less than 0.9.

9.11. Additional Quantification for All Sectors

This section outlines quantification rules set out in sections 16 that apply specifically to facilities engaged in the industrial activities in items 1 to 37, column 1 of Schedule 1.

As per subsection 16(1), the production of petrochemicals identified in item 17 of Schedule 1, **as a by-product** is only considered an industrial activity if the facility is engaged in the industrial activity set out in item 17 of Schedule 1.

Subsection 16(1): Additional production of petrochemical products as a by-product

Quantification of GHGs	Subsection 16(1) • For the purposes of section 17, quantify GHGs arising from the production of petrochemical products as a by-product using quantification methods applicable to the facility's industrial activity (applicable Part of Schedule 3 and paragraphs 17(2)(b) or (c), as applicable).
Quantification of Production	Subsection 16(1) • The facility is deemed not to be engaged in the production of petrochemicals for the purposes of quantifying production and calculating the emissions limit.

- Production of petrochemicals as a by-product is not required to be quantified and reported; and
- The OBS for the production of petrochemicals (item 17 of Schedule 1) cannot be used in the calculation of the emissions limit.

Example 18: Production of petrochemical products

A petroleum refinery produces a petrochemical product as a by-product. The GHGs arising from the production of the by-product petrochemical are quantified using the methods specified in Part 3 of Schedule 3 for petroleum refining and those GHGs are included in the facility total quantity of GHGs as calculated in subsection 17(1).

The quantity of by-product petrochemical produced is not included in the calculation of the emissions limit for the facility, calculated as per section 36 and the OBS for the by-product petrochemicals does not apply.

APPENDIX A FREQUENTLY ASKED QUESTIONS

A.1: Quantification of GHGs and Special Rules

1. I burn biomass in my facility, do I need to quantify it and include it in my facility emissions?

As per subsection 22(1), CO_2 from biomass **is not quantified and is not included in the quantity of CO_2** when quantifying the facility's total quantity of GHGs from the facility as per subsections 17(2) to (4) or subsections 20(2) to (5). However if a CEMS is used to measure the quantity of CO_2 at the facility then CO_2 from biomass will have to be quantified and deducted from the quantity of CO_2 as measured by the CEMS. The quantity of CO_2 from biomass **are not to be reported** as part of the facility's annual report.

As per subsections 17(5) and 20(6), CH_4 and N_2O generated from stationary devices that combust biomass for the purpose of producing useful heat **must be quantified** but **are not to be included** in the quantity of GHGs from stationary fuel combustion emissions calculated in subsections 17(2) to (4) or subsections 20(2) to (5). These quantities of CH_4 and N_2O **are to be reported separately** as part of the facility's annual report (section 4 of Schedule 2).

2. I am an oil and gas production facility primarily engaged in natural gas processing, do I need to quantify my methane emissions?

As per subsection 22(2), quantification of CH_4 from venting or leakage emissions **is not required** for facilities engaged in:

i. bitumen and other crude oil production (item 1 of Schedule 1);
ii. bitumen and heavy oil upgrading (item 2 of Schedule 1);
iii. natural gas processing (item 4 of Schedule 1); and
iv. natural gas transmission (item 5 of Schedule 1).

3. Are the emissions from 3rd party operated machines/equipment covered under the Regulations?

All emissions from the specified emission type identified in subsection 5(1) of the Regulations are counted toward the facility emissions. These include emissions from machines and equipment that are operated by third parties if those machines or equipment are integral to the industrial activity.

In order for a facility to determine if the machines or equipment are part of the facility, it will need to be reviewed with the definition of facility in the Regulations; in particular subsection 1(2).

A.2: Alternative Method

4. Can the Minister revoke a permit?

Yes, if the Minister has reasonable grounds to believe that the applicant provided false or misleading information in support of their application for a permit.

5. How does the Minister revoke a permit?

A notice of revocation will be provided in advance, which includes written reason for the revocation, and an opportunity to make written representation in respect of the revocation. If the Minister still believes on reasonable grounds that the permit holder has provided false or misleading information, the revocation will be effective 30 days after the date of the notification.

6. Can a permit be renewed?

Yes, if the previous criteria for the permit application continues to be met and the renewal request is submitted to the Minister at least 90 days before the expiration of the current permit. The person responsible for a facility must include in their renewal application the information listed in Schedule 4 and an explanation of the reasons why the prescribed method in the Regulations was not implemented within the period identified in the initial permit application.

A.3: Thermal Energy

7. How does a facility calculate the ratio of heat if it produces or buys thermal energy?

The ratio of heat is equal to 1 for a facility that produces thermal energy from the combustion of fossil fuels only. However, the ratio of heat must be calculated if the facility that produces thermal energy from the combustion of fossil fuels and biomass, in accordance with section 34. Refer to section 6.3 of this document.

8. What if the thermal energy is sold to a non-covered facility (e.g. district heating)?

The quantity of thermal energy sold to a non covered-facility is not required to be reported.

9. What does a person responsible for a covered facility need to report if they produce and sell thermal energy to another covered facility?

1. The name of the covered facility to which thermal energy was sold to;
2. The covered facility certificate number issued to the facility to which the thermal energy was sold to;
3. The quantity of the thermal energy sold, expressed in gigajoules:
    a. based on sales invoices; or
    b. an objective method where the sales invoices are not available.
4. The thermal energy's temperature and pressure.
5. The ratio of heat determined in accordance with section 34.

10. What does a person responsible for a covered facility need to report if they buy thermal energy from another covered facility?

1. The name of the covered facility from which they purchased thermal energy;
2. The covered facility certificate number issued to the facility from which the thermal energy was purchased;
3. The quantity of thermal energy bought, expressed in gigajoules:
    a. based on sales receipts; or

b. an objective method where the sales receipts are not available.

4. The thermal energy's temperature and pressure.
5. The ratio of heat determined in accordance with section 34.

A.4: Production

11. How do I quantify my production if I am a voluntary participant with a specified industrial activity?

If the facility is engaged in a specified industrial activity that is listed in Schedule 1, then the production must be quantified based on the unit of measurement in column 2 of Schedule 1. In addition, review the applicable Part in Schedule 3 to ensure any additional quantification rules are met. If the specified industrial activity is not listed in Schedule 1 then production is quantified in the units of measurement that are included in the request under subsection 172(1) of the Act.

12. I have a lot of back-up generators at my industrial facility, do I still need to quantify the generation of electricity from them?

The total electricity generated from an industrial facility must be quantified in accordance with sections 6 and 7 of Part 38 of Schedule 3. As per subparagraph 31(1)(b)(ii), the electricity generated can be quantified in whole or in part or not quantified at all. However, GHG emissions from the production of electricity at the facility must always be included in the facility total quantity of GHGs. As per section 15 of Schedule 2 (annual report), a list of equipment from which electricity was generated but not quantified is required.

13. Are there any accuracy requirements associated with measuring production?

Yes. Subsection 31(2) states that any measuring device used to measure production must have an accuracy of within ±5% and be installed, operated, maintained and calibrated in accordance with the manufacturer's specifications or any applicable generally recognized national or international industry standard. However, **for the 2019 calendar year,** production is to be quantified with an accuracy of ±5%.

14. Does my facility need to round the total production?

Yes, any annual production value that is included in the annual report must be rounded to three significant figures.

For example, if the total production of vaccine in 2019 is 3245.7 litres, the amount reported in the annual report would be 3250 litres.

15. Are fuels derived from fossil fuels considered fossil fuels?

A fossil fuel includes fuels derived from fossil fuels for the purposes of the Regulations.

A.5: Carbon Capture and Storage

16. Is there a benefit for a facility to capture and store CO_2? How is the captured and stored CO_2 quantified?

The quantity of CO_2 captured and stored can be subtracted from the facility's total quantity of GHGs, determined in section 17(1) and 20(1) if the requirements in subsection 35(2) are met. The quantity of CO_2 captured and stored is determined using the quantification method described in section 1 of GHGRP.

17. Are there any requirements for carbon capture and storage?

The quantity of CO_2 that is injected and permanently stored in a geological site must meet the following criteria:

1. The geological site into which the CO2 is injected is:

i. a deep saline aquifer for the sole purpose of storage of carbon dioxide, or
ii. a depleted oil reservoir for the purpose of enhanced oil recovery; and

2. The CO_2 captured, transported and stored must comply with the laws applicable to Canada or a province or applicable to the United States or one of its states.